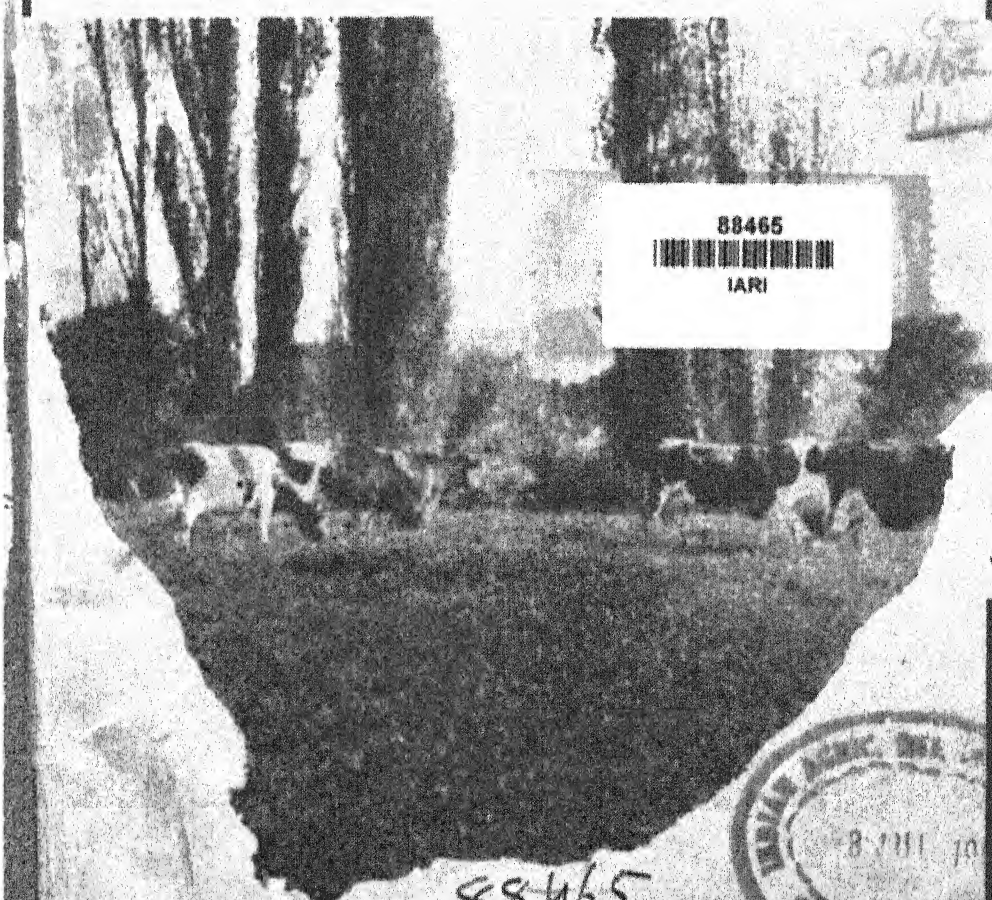
VOL. 17 No. 190 JANUARY 1942

FARMING in South Africa

(Incorporating "Crops and Markets".)

Registered at the G.P.O. as a Newspaper



THE DEPARTMENT OF AGRICULTURE AND FORESTRY

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Assistance Bursaries for Agricultural Study (O.F.S. Act No. 34 of 1909).

Attention is invited to the fact that annually a limited number of assistance bursaries for agricultural study is made available by the Department of Agriculture and Forestry, *for children of inhabitants of the Orange Free State*.

The following bursaries are available:—

(*a*) £20 per annum each for candidates for the Two-Year Diploma Course at any of the Agricultural Colleges, viz., Glen, O.F.S.; Potchefstroom, Tvl.; Cedara, Natal; Grootfontein, Middelburg (Cape); Stellenbosch-Elsenburg, Stellenbosch (Cape).

Applications should be addressed to the Principal of the Institution concerned.

(*b*) £40 per annum each for students at the Normal College, Bloemfontein, who are candidates for the One-Year Certificate Course at the College of Agriculture, Glen, O.F.S.

Applications should be addressed to the Secretary for Education, Bloemfontein.

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[NOTE.—Articles from *Farming in South Africa* may be published provided acknowledgment of source is given.]

COURSES OF INSTRUCTION

During 1942

at the

Stellenbosch-Elsenburg College of Agriculture of the University of Stellenbosch.

A. Courses in General Agriculture:

(a) *University Courses at STELLENBOSCH commencing on 2 March:*

Degree Courses in Agriculture—B.Sc., M.Sc., D.Sc.
Degree Courses in Home Economics—B.Sc., M.Sc.
Degree Courses in Forestry—B.Sc., M.Sc., D.Sc.
Two-year Diploma Course in Home Economics.

(b) *Non-University Courses at the ELSENBURG EXPERIMENT STATION:*—

Two-year Diploma Course in Agriculture, commencing on 26 January, 1942. Fee: £36 per annum.

B.—Short Courses:

(a) *At ELSENBURG*:—

Viticulture	19 to 23 January
Poultry-farming	29 June to 3 July
Dairy-cattle Farming, Dairying, and Pig-farming ...	29 June to 3 July
Dairying	29 June to 3 July
Grain and Sheep-farming (including fat lambs)	7 to 11 September

FEE (Board and lodging included): £1. 10s. for each course.

(b) *At STELLENBOSCH (in the Agricultural Building)*:—

Home-economics	29 June to 3 July
Fruit Culture and Viticulture ...	29 June to 3 July
Grain Grading ...	29 June to 3 July

Attendance fee 5s. for each course. (*Board and lodging obtainable in town.*)

Railway-concession certificates will be issued to applicants who have to travel by train to attend any of these courses. Entries for a course close seven days before its commencement.

For full particulars:

Apply to THE PRINCIPAL,
COLLEGE OF AGRICULTURE,
STELLENBOSCH.

HORSE IMPROVEMENT

Stallions will stand at stud at the following Government Institutions during the breeding season, 1941-1942:

1. College of Agriculture, Middelburg, Cape: Percheron.
2. College of Agriculture, Potchefstroom, Tvl.: Percheron, Thoroughbred and Donkey Jack.
3. College of Agriculture, Glen, O.F.S.: Percheron, Thoroughbred and Donkey Jack.
4. College of Agriculture, Cedara, Natal: Percheron.
5. Stellenbosch-Elsenburg College of Agriculture of the University of Stellenbosch, Stellenbosch, C.P.: Percheron.
6. Veterinary Research Station, Ermelo: Percheron and Thoroughbred.

All service fees are £1. 1s. per service.

Maintenance and grazing fees are 2s. 6d. per week, but an additional fee of 1s. per day is charged when supplementary feeding is found necessary or when such feeding is especially requested by mare owners.

As a veterinary examination is necessary before mares are sent for service, farmers who desire to make use of the facility, should act at once, as only a limited number of mares can be accommodated at one time at institutions.

The South African Railways allow a rebate on all mares sent for service.

Further particulars of the horse improvement scheme are obtainable on application to the institution to which it is desired to send mares for service.

Courses at Colleges of Agriculture, 1942.

Applictions to be Addressed to the Principal.

At Grootfontein (Middelburg, Cape):—Two-year Diploma Course in General Agriculture, from 4 February 1942, to about 25 November 1943.

Applications close on 24 January 1942.

Fees: 1st year £36, 2nd year £34.

(*N.B.*—The second year of the course is devoted mainly to Sheep and Wool.)

Eight-months' Special Course in Sheep and Wool, from 18 February to 30 September 1942.

Applications close on 13 January 1942.

Fees: £28.

At Cedara, Natal:—Two-year Diploma Course in General Agriculture, from 27 January 1942, to about 10 December 1943.

Fees: £36 per annum.

At Potchefstroom, Transvaal:—Two-year Diploma Course in General Agriculture, from 28 January 1942, to about 10 December 1943.

Fees: £36 per annum.

Three-weeks' Special Courses in Grain Grading, from 20 April to 8 May and 6 to 24 July 1942.

Fees: £4. 10s. per course.

At Glen, Orange Free State:—Two-year Diploma Course in General Agriculture, from 3 February 1942 to about 10 December 1943.

Fees: £36 per annum.

Eight-months' Special Course in Factory Dairying from 3 February to 25 September 1942.

Fees: £28.

Three-months' Special Course in Sheep and Wool Classing, from 3 February to 1 May 1942.

Fees: £12.

Three-weeks' Special Course in Grain-grading, from 4 to 22 May 1942.

Fees: £4. 10s.

Four-weeks' Special Course in Milk-testing and Cheese-making (Theory) for Experienced Cheesemakers, from 15 June to 10 July 1942.

Fees: £6.

Four-weeks' Special Course in Milk- and Cream-testing, from 20 October 1942.

Fees: £6.

A NEW LIST OF

Bulletins for Farmers

is now available.

ISSUED GRATIS.

Apply for a copy to

THE EDITOR,
Department of Agriculture and Forestry, Pretoria.

A New Year's Message:

Providing Food for Man and Raw Materials for Industry.

By Col.-Comdt. the Hon. W. R. Collins, D.T.D., D.S.O.,
Minister of Agriculture and Forestry.

ONCE AGAIN we stand on the threshold of a new year and each one of us is filled, on the one hand, with hope, and on the other, a desire to know what the coming year holds in store.

Amid the prevailing uncertainty, there remains for the farming community the reassuring fact that there *must* always be a demand for the great majority of our agricultural products—products which serve as food for man and as raw materials for the various industries. So long as a country's sources of food are assured and its industries are working to their full capacity in supplying secondary products and are providing employment for its population, there need be little fear about the future.

My message for the New Year therefore is: *Produce according to market indications, avoid all unnecessary expenditure, adapt production to the potentialities of your farm, and do not be misled by the spirit of speculation.*

The whole world is crying for food, and when peace comes, as it must, the question of food supplies will be one of the greatest problems to be solved. It is my fervent hope that every farmer will exercise the greatest vigilance and circumspection in his work of primary production and that he will assist the State in its endeavour to keep our agricultural industry on a sound and stable footing.

W. R. Collins

Minister of Agriculture and Forestry.

Information on Departmental Publications.

Farming in South Africa, the monthly journal of the Department, contains popular as well as scientific articles on a variety of agricultural topics, useful to both the farmer and the housewife, while the **Crops and Markets** Section, supplies information on crop prospects, market prices and exports of agricultural produce.

The following particulars in regard to subscriptions and advertisements should be noted:—

Subscription.—Within the Union, South West Africa, Bechuanaland Protectorate, Southern Rhodesia, Swaziland, Basutoland, Mocambique, Angola, Belgian Congo, and British Territories in Africa 5s. (otherwise 7s. 6d.) per annum, post free, payable in advance.

Applications, with subscriptions, to be sent to the Government Printer, Koch Street, Pretoria.

Advertisements.—*The Tariff for Classified Advertisements is:* 2d. (two pence) a word with a minimum of 5s. per advertisement (prepaid). Repeats, not entailing any change in the wording, will be published at half the cost of the original.

Conditions:—

(1) The advertisement will be classified under specific headings, and only one black letter (initial letter) is permitted.

(2) Advertisements in which prices are mentioned must contain the name and address of the advertiser. A nom-de-plume or box number only is not sufficient, and unless this condition is strictly observed advertisements will not be accepted.

(3) Advertisements will be classified strictly in accordance with the subject matter of the announcement, determined by the first item mentioned, and cannot be inserted under irrelevant headings.

(4) Displayed, classified advertisements will also be accepted. The charge however, will be 10s. per inch, single column, per insertion without reduction for repeats.

Copy for Advertisements to be in the hands of the Government Printer, Pretoria, not later than the 20th of the month preceding publication.

Send all advertisements direct to the Government Printer, or write to him for details as to tariff for advertisements.

Popular Bulletins.—Bulletins on various agricultural topics are published by the Department to meet public demand. A list of available bulletins giving particulars of cost, etc., is obtainable free of charge from the Editor, Department of Agriculture and Forestry, Pretoria.

Scientific Publications.—From time to time the different Divisions of the Department issue science bulletins incorporating the results of research work conducted by them. Other scientific publications issued are: "The Onderstepoort Journal", "Memoirs of the Botanical Survey of South Africa", "Bothalia", "Entomological Memoirs" and the "Annual Reports of the Low Temperature Research Institute". Information in regard to these publications is obtainable from the Editor, Department of Agriculture and Forestry, Pretoria.

Weekly Press Service.—The Press of South Africa is supplied weekly with a bulletin of agricultural information for their exclusive use. This information is published weekly by all newspapers and other journals throughout the country.

Farmer's Radio Service.—In addition to the printed information supplied by the Department to members of the farming community, the Department, in collaboration with the South African Broadcasting Corporation, also maintains a daily broadcasting service to farmers. Information in regard to times of broadcasting is contained in the programmes issued by the Broadcasting Corporation.

Inquiries.—All general inquiries in regard to the publications of the Department, including the Radio Service, should be addressed to the Editor, Department of Agriculture and Forestry, Pretoria.

D. J. SEYMORE, Editor.

FARMING IN SOUTH ... AFRICA

Vol. 17 JANUARY, 1942 No. 190

Editorial:

Changing Conditions.

For the past fifteen years and even during the depression of 1932-33, *Farming in South Africa* has conveyed the Department's message of better farming to our farmers without any change in its outward form. Now, however, war conditions have made it imperative that the monthly journal of the Department should assume a different format in order to keep pace with the available supplies of paper.

Many readers will, no doubt, welcome the new format which admits of easier handling. They will, moreover, now obtain information taken from *Crops and Markets* which will henceforth be incorporated in this journal.

During the last war, publication of the Agricultural Journal was suspended, but owing to the unbridgeable gap which was caused in our agricultural literature, the Department is reluctant to contemplate taking such a step again, and for that reason has preferred to decide upon the fusion of publications in smaller format.

It is now more necessary than ever before that farmers should exercise the greatest vigilance in their farming enterprise and steer their course in the right direction so that they will be able to face the difficulties of the post-war period. The Department, therefore, wishes to maintain the closest contact with the farming community in order to strengthen the agricultural industry and to issue warnings from time to time against impending dangers or wrong directions whenever that may be necessary.

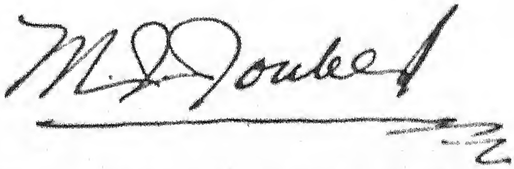
While making this announcement of the change of format, I also wish to take this opportunity of addressing a short New Year's message to our farmers and to exhort them to exercise the greatest circumspection in their undertakings. Farmers produce for their own needs and also for the market, but overproduction for the latter is sometimes the cause of serious surplus problems which usually make it extremely difficult to obtain reasonable prices or to find suitable markets for primary products.

It is the constant endeavour of the Department and the various control boards to assist the farming community in these difficulties. Owing to the prevailing abnormal conditions, however, the temporary demand for certain products is exceptionally heavy at the moment, but we have no assurance whatever of the permanency of this demand at the present level. Exercise the utmost caution, therefore, and do not neglect the other essential adapted products for which there will

again be a livelier demand later on. Farmers should continually be on their guard against the possibility of lack of equilibrium in our agricultural production, and I, therefore, wish to advise them not to follow abnormal price tendencies blindly but to keep in close touch with the Department for the necessary enlightenment.

Therefore, if you are in a position to do so, supplement your farming activities with the production of products for which there is a heavy demand to-day, but guard against a complete switch-over and do not be tempted by attractive prices into converting your proven crop-raising farm into a precarious stock farm, or *vice versa*.

My best wishes for a prosperous year in the field of agriculture.



Acting Secretary for Agriculture and Forestry.

Tobacco in Oudtshoorn.

A Review of the 1940-41 Season by the Division of Animal and Crop Production.

DURING the past season the tobacco crop in the Oudtshoorn area was comparatively free from disease. Very little mosaic made its appearance, and "Kromnek", white rust, angular leaf-spot and other diseases caused little damage. This, no doubt, was due to the extremely dry conditions that prevailed during the greater part of the growing season.

Insect pests were not very active, but nematode (eelworm) was fairly general in fields where a short rotation of crops was followed.

An area of 1,366 morgen of ground was planted. This was 776 morgen less than the area planted in the previous year (1939-40). Of this area only 16 morgen were grown for flue-curing. A crop of 1,883,107 lb. was produced, i.e., over 3,000,000 lb. less than the crop of the previous year. This was due largely to the severe drought which prevailed.

Of this crop, 866,000 lb. consists of light air-cured leaf, 1,000,000 lb. of dark air-cured leaf and only 17,107 lb. of the flue-cured type. The flue-cured crop was about 56,000 lb. less than that of the previous season. Of the 14 flue-barns built in the Oudtshoorn area only 9 were in operation.

It would appear that although the quality of the air-cured tobacco has improved considerably during the past ten years and the

 [Continued on page 24.

The Cultivation of Soybeans.

J.J. du Toit, Lecturer in Agronomy, Potchefstroom College of Agriculture.

THE soybean is an annual summer legume, indigenous to the Far East where, together with rice, it has formed the staple diet of Oriental nations for more than five thousand years. On account of the exceptionally high protein content of the seed (33·2 per cent. digestible protein) it forms an excellent and cheap substitute for meat. The Chinese and Japanese nations in fact depend upon this

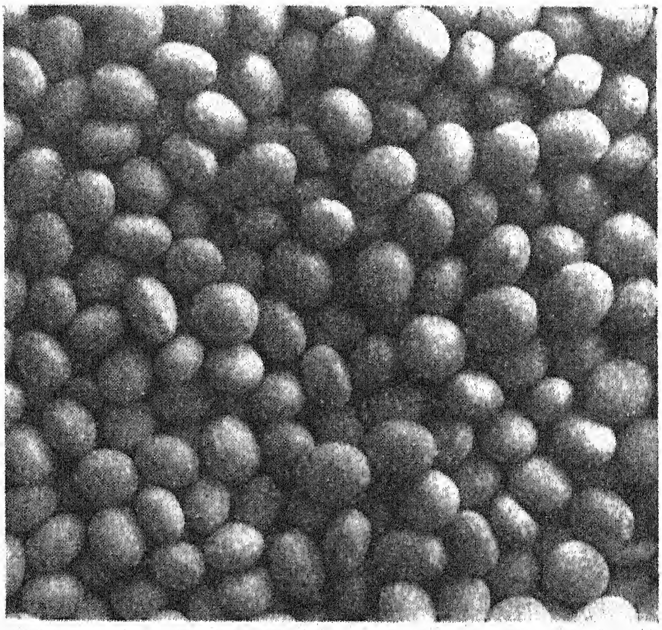


Fig. 1.—Soybean seed, natural size.

wonder bean for their subsistence. Manchukuo annually produces more than fifty million bags of soybeans and large quantities are exported to Europe and other parts of the world.

During the nineteenth century, when soybeans were imported into Europe for oil production purposes, this legume began for the first time to receive attention in the Western hemisphere. Actually it is only during the past 25 years that large-scale production has been undertaken and that only after the Americans began to realize its value. At the present time, the United States produces more than twelve million bags annually.

Uses and Market Prospects.

The soybean can truthfully be called the world's wonder crop on account of the numerous uses to which it can be put. These can briefly be summarised as follows:—

(1) *As food for man and beast.*—As mentioned before, the protein content of the seed is exceptionally high, viz., approximately three times as high as that of wheat and more than twice that of fresh meat. Soybeans can be successfully stored for long periods more readily than meat and although it may not possess the same biological value as food, it is a very good substitute for meat, especially in time of war. Apart from its value as food for soldiers, the soybean is undoubtedly an asset in countries where the poorer classes cannot afford meat regularly, since it can be produced much more economically than meat. Soybeans are also used in the form of meal (prepared by a special process) mixed with wheaten flour and mealiemeal in order to increase the nutritive value of the latter and furnish a better balanced ration for man and beast. In future large quantities of soybeans will probably be used in South Africa, e.g., in the diet of natives on the mines. At present there are millers at Delmas, Johannesburg and elsewhere who are anxious to obtain soybeans for milling purposes and offer comparatively high prices. From experiments carried out by the Low Temparature Research Institute at Cape Town, soybeans can be canned successfully for human consumption. This bean is also suitable for table use both in its green, shelled form and after ripening. Various tasty dishes can be prepared from these beans.

From a stock-feeding point of view soybean meal can be used to advantage in intensive dairy, poultry and pig farming as a substitute for a portion of the meat meal in the rations, when meat meal is expensive and difficult to obtain. Most farmers wish to be selfsupporting and therefore try to produce all the stock-feed they require. This crop makes excellent hay and silage. The plants are erect and can therefore readily be cut with a mower. The hay contains approximately 12 per cent. digestible protein and can be used instead of lucerne where the latter cannot be raised successfully under dry-land conditions.

(2) *In Industry.*—In this sphere the soybean is even more remarkable. In addition to its high protein content,it also has a comparatively high oil content (15 per cent. to 20 per cent.). Soybean oil is used in soap and candle-making, and in the manufacture of paints, linoleums etc. The oil cake is not only a valuable stock-feed but is also used industrially for the manufacture of knife handles, ash trays, artificial ivory, steering wheels and other motor car and aeroplane parts, explosives, artificial silk, cosmetics, perfumes, etc. Soybeans play an important part in motor industry in the United States of America and the production of soybeans has increased by more than a thousand per cent. during the past fifteen years.

(3) *Effect on soil fertility.*—Another important advantage attached to this crop is the beneficial effect its cultivation has on

the fertility of the soil. Of all our national problems, the impoverishment and erosion to which our soil is continually subjected, is undoubtedly the most important. Our national assets are wasted not only by systems which cause deterioration of our grazing and erosion of our soil but also by that system of continuous grain production which results in a gradual exhaustion of our agricultural soil. When devising a permanent system of agronomy, the inclusion of some legume or other in a system of rotation with maize and other crops, is essential for the purpose of maintaining the fertility of the soil. It is well known that the nodules developed on the roots of legumes by certain bacteria increase the nitrogen content of the soil, for the benefit of the next crop. Up to the present very few legumes could be recommended to serve as partial and equally profitable substitutes for mealies. Most farmers are keen to produce a cash crop and hay-producing legume crops can occupy only a limited area of the lands set aside for maize. A cash crop like groundnuts is limited to areas with a long growing season and is unsuitable for the central highveld. Ordinary beans are profitable and in great demand for human consumption as long as the war lasts, but will not, in the long run be able to play such an important rôle as soybeans, since the latter have more uses, especially in the field of industry.

Adaptation.

The soybean is an erect type of legume requiring a warm and relatively moist growing season of approximately 4 to 4½ months, or longer, according to the needs of the variety concerned. As in the case of most other crops, there are early as well as late varieties. The crop is reasonably drought resistant but as a rule the yield is poor in areas with an average annual rainfall of less than 21 inches. Cowpeas are generally more successful than soybeans in such dry areas. On the highveld and other areas with an annual rainfall of 25 to 35 inches the soybean gives excellent returns provided it is cultivated in the right way, as will be explained later.

An added advantage of the soybean is that it is not subject to rust as is the case with ordinary beans. It therefore thrives in the mist belt as well as in the warm lowveld, where irrigation water or rainfall is adequate. It is ,for example, a suitable summer crop. to put in towards the beginning of December after the wheat has been gathered. The practice of cultivating maize immediately after wheat on irrigated lands, must be condemmed since it leads to loss of soil fertility.

Attention should be drawn to the fact that soybeans, like ordinary beans, are susceptible to eelworm or nematode attacks and can therefore not be recommended for inclusion in systems of crop rotation together with tobacco, tomatoes or potatoes on soils already infested.

Broadly, it may be stated that soybeans do well wherever mealies can be cultivated with success. During the autumn soybeans can withstand frost better than maize, especially after the pods have been formed.

Varieties.

Different varieties with yellow, brown, green and black or even two-coloured seeds are found. The trade prefers the yellow-seeded varieties.

One of the main reasons why soybeans have not been cultivated in our country in the past is the fact that all the imported varieties tested since 1903 had the disadvantage that, under our climatic conditions, they shatter their seeds on the land as soon as the pods ripen. This difficulty has, however, been surmounted by the breeding of improved adapted varieties at the Potchefstroom College of Agriculture, and these tested varieties are the only types that can be recommended. Up to the present, three such varieties (yellow-seeded) have been issued to farmers, viz., strains No. 34.S.51, No. 34.S.395 and No. 34.S.256. The first-mentioned has already been widely distributed, although the second is poplar on the central highveld since it ripens somewhat sooner than the other. All these improved strains are also suitable for hay production.

Soil and Fertilizer Requirements.

The soybean does well on most of the common agricultural soils which are not too acid or impoverished. It prefers a fertile sandy loam. An application of 300 to 400 lb. super-phosphate per morgen will give good results on most soils. If soybeans are grown in rotation with other crops like mealies, the fertilizer may be applied to the preceding crop and the beans will benefit from the residual effect.

Inoculation.—A practice to be recommended, in most areas, is the artificial inoculation of the soil in which soybeans are to be planted, with the nodule-developing bacteria. In the case of most other legumes such as cowpeas, ordinary beans and lucerne, the bacteria which develop the beneficial nitrogen-rich nodules on their roots, are usually present in the soil. This is not however, the case with the specific strain which develops on soybeans.

There are two common methods of inoculation. The easiest entails treating the seed with commercial cultures obtainable from general seedsmen in Johannesburg and other centres. These cultures are sold in bottles or in black powder form in tins, and full instruction for treating the seed are furnished on the labels. On the bottles is also specified a date, after which viability of the bacteria is not guaranteed.

When buying such cultures, farmers must therefore ensure that the culture is not already too old. They must also see to it that the correct culture is ordered, viz., bacterial culture for inoculating soybeans. The containers must not be opened until just prior to being used.

One small tin of the culture usually contains sufficient material to treat one bushel, i.e., approximately 60 lb., of seed and the price usually ranges from 3s. to 4s. per tin. The seed is treated by placing it in a bath or drum and adding to it the culture, which

must previously be mixed with two tins of water. Although it is not mentioned in the directions, farmers may add a level teaspoonful of sugar to each tin of water in order to ensure that the material will adhere to the seed when dry. Mix the seed and material thoroughly by hand and then spread the beans out on bags or on a piece of canvas in the shade to dry. Plant the seeds immediately after drying. The application of fertilizers by means of apparatus attached to a planter, cannot be recommended in the case of inoculated seed since the bacteria may be destroyed by the fertilizer. The fertilizer should be broadcast and worked into the soil prior to planting.

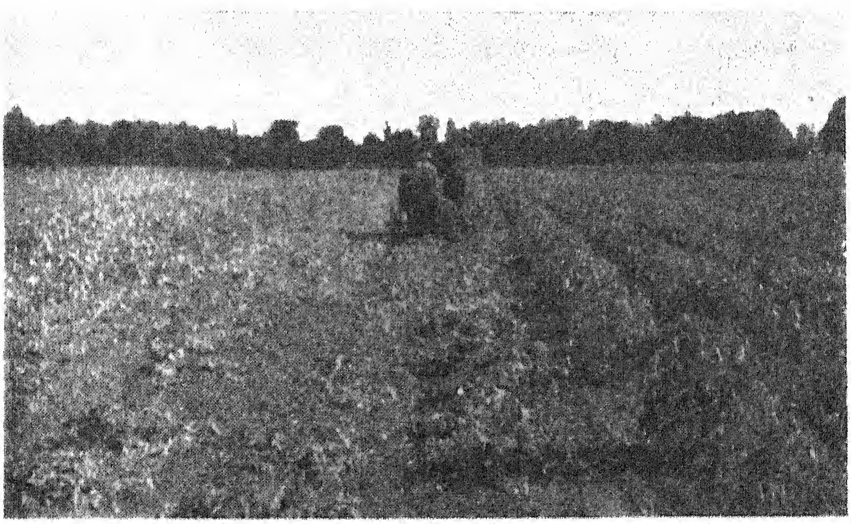


FIG. 2.—Cutting Soy beans for hay at Potchefstroom College of Agriculture.

Well developed plants may be lifted out carefully with a spade and the soil shaken off in order to determine whether the nodules have developed on the roots. These nodules should adhere to the roots and must not take the form of bulges of the roots themselves. Such swellings may be caused by nematodes which constitute a dangerous pest.

Once the soil has been properly inoculated with the beneficial bacteria, the culture need not be applied again, provided soybeans are grown on that particular land once every three or four years.

Method of Planting.

Approximately 60 to 80 pounds of seed is required per morgen, depending on the spacing.

The best time for planting is from October to November on the highveld and up to the middle of December in the Warm areas.

The growing period of variety No. 34.S.51 is approximately 130 to 135 days.

Soybeans may be planted by means of a mealie planter in rows 24 to 30 inches apart, depending on the rainfall in the particular area. The rate of seeding in rows should be high, i.e., with a spacing of 2 to 3 inches, for the following reasons:—

(1) Germination is often poor, due to hardness of soil crust, lack of moisture, etc.;

(2) damage by insects often occurs;

(3) the seed is often broken in the planter;

(4) rotting due to excessive depth of planting often occurs;

(5) results indicate that close spacing ensures the best results.

The depth of planting should not exceed $1\frac{1}{2}$ to 2 inches. Breaking of the seed can be avoided by removing the springs underneath the knockers or separators over the plates in the seed hoppers or using only half a spring under each. Ordinary maize plates with 10 or 12 holes per plate will usually ensure a spacing of from 2 to 3 inches. Plates $^{7}/_{16}$ inch thick with $\frac{3}{8}$ inch holes are the most suitable. The planter should first be tested out on hard soil and extra holes should be drilled in the plates if necessary. A wheat planter with some of its drills filled up so as to ensure planting in rows 28 inches apart, may also be used.

Under irrigation the spacing of the rows may range from 21 to 24 inches.

Cultivation.

The soybean requires a higher standard of cultivation than maize because the plants cannot compete with weeds as strongly as maize. It is very important that the land should be freed of weeds once or twice by means of harrowing or cultivating, prior to planting. The best procedure is to plough the soil during winter and to destroy the weeds 8 or 10 days after the first rains, at the same time preparing a fine seedbed. If time permits, a second crop of weeds can be destroyed before planting the beans. A fine seedbed, free of large clods and depressions, is essential in order to ensure a uniform depth of planting and successful germination. Moisture condition at planting should also be studied since soybeans are apt to fail on account of mould growth in half-dry soil. The best time to plant , is after a good rain as soon as the soil can be cultivated over while it is still moist. If rains, falling after planting has taken place, cause compacting of the soil a light harrow can be used to advantage, 4 or 5 days after the rains and before the beans appear, to break the crust and destroy weeds at the same time. After the plants have emerged and the first leaves have been formed, the harrow must be used with great care since the young plants are more susceptible to damage than maize plants. Nevertheless, the harrow can be used successfully if it is pulled across the rows and during the heat of the day when the plants are slightly wilted. As in the case of mealies, the cultivator should be used regularly from

the time the plants are 5 to 8 inches high and as soon as weeds appear. In some cases it will pay to hand-weed between the rows.

Harvesting.

Soybeans have this peculiarity that the pods all ripen more or less at the same time, while the leaves turn yellow and drop even before the pods are quite ripe. Harvesting at the correct time is very important. If harvesting is delayed too long the pods may shatter even in the case of the improved varieties. The safest procedure is to cut the crop with a mower or with sickles or native hoes as soon as the pods turn brown, but while the stems of the plants are still succulent. In this condition the plants may be stacked into windrows and left a few days to dry out further. Care

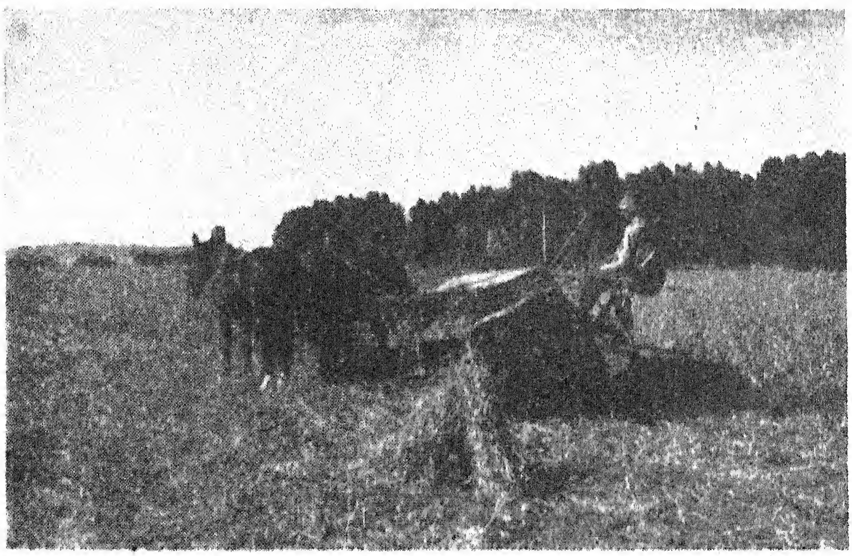


FIG. 3.—Harvesting mature Soy beans with a self-binder at Potchefstroom College of Agriculture.

should be exercised not to remove the material for stacking in large ricks before the stems are quite dry since moist plants will generate heat and become mouldy.

Small crops can be threshed like ordinary beans with the aid of sticks or may be trampled out by animals, a motorcar or a tractor on a suitable threshing floor. For larger crops special soybean threshing machines can be used or otherwise wheat threshing machines adapted to the purpose. In the latter case the speed of the drum must be reduced by half using larger driving wheels, the speed of the rest of the machine remaining unchanged. The concave must also be adjusted further away from the drum and suitable sieves must be inserted. Mealie threshing machines can usually not be

used for this purpose. The "Sunshine Sheller", however, is provided with a special device for threshing soybeans.

Yields per Morgen.

Whereas 8 to 20 bags may be obtained under dry-land conditions, depending on rainfall and cultivation, 25 bags or more under irrigation is not impossible. In demonstrations on 10 morgen plots carried out by the extension officer at Standerton under dry-land conditions, a yield of 19 bags per morgen was obtained during the 1940-41 summer season. A dense stand and thorough weed control are essential for ensuring high yields.

Hay and Silage.

For this purpose the plants must be cut with a mower as soon as the pods are well formed and before the leaves start turning yellow. The plants are first raked into windrows and after 2 or 3 days into small cocks and left for 5 to 8 days to dry thoroughly. The material is then carted out and deposited in large stacks on a suitable site. If the stems are still succulent, heat will be generated and mould growth will occur. On the other hand the plants must not be too dry, otherwise the leaves will crumble when the hay is handled. Yields of from 3 to 5 tons of hay per morgen can be obtained.

If a self-binder is available it can be used to advantage for cutting soybeans for hay. The sheaves are stacked erect in groups and left until dry.

Crumbling and considerable waste of leaves (the most nourishing part of the plant) often take place where legumes are used for hay. In order to prevent this it is perhaps better to store the plants in the form of silage. If the legume is ensiled alone it is necessary to add molasses, viz., three gallons of ordinary molasses (50 per cent. sugar) diluted with 6 to 8 gallons of water, per ton of green legumes. This is not necessary, however, in cases where the legumes are mixed with maize plants in the ratio of 1 part legumes to 2 or 3 parts green maize plants (by weight). Particulars for making silage and further information regarding soybeans are obtainable from the Colleges of Agriculture.

General Observations.

The soybean requires a higher standard of cultivation than maize and it also has its own specific problems, as for instance difficulties in connection with proper germination and with the threshing of the seed. As a rule, however, it is not attacked by weevils and can safely be stored for long periods. As soybean production increases, the necessary threshing-machines will also become available as is the case in the maize industry to-day.

As regards the cost of production per morgen, there is very little reason why it should be much higher than that of maize and although the yield may under similar circumstances sometimes be lower, the selling price per bag generally is two to three times as

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Wool Packing and Marking Regulations.

THE Secretary for Agriculture and Forestry has ruled that the following alterations to the existing packing and marking regulations shall be brought into force at the beginning of the season commencing August 1942 and we take this opportunity of warning our readers accordingly:—

"(4) All bellies, pieces and skirts shall be removed from all other wool and shall be packed separately. The container shall be marked C.B.P. if the average length of the contents is 1¾ in. or over, or B.P. if the average length is below 1¾ in. (Pieces and skirts include all the short extremities of fleeces, as well as kempy, hairy and matted pieces except LOX)."

"(6) (2) If any person has acquired from any other person wool in a container bearing the name and address of that other person, such name and address shall remain on the container and the name and address of the first-mentioned person shall be added."

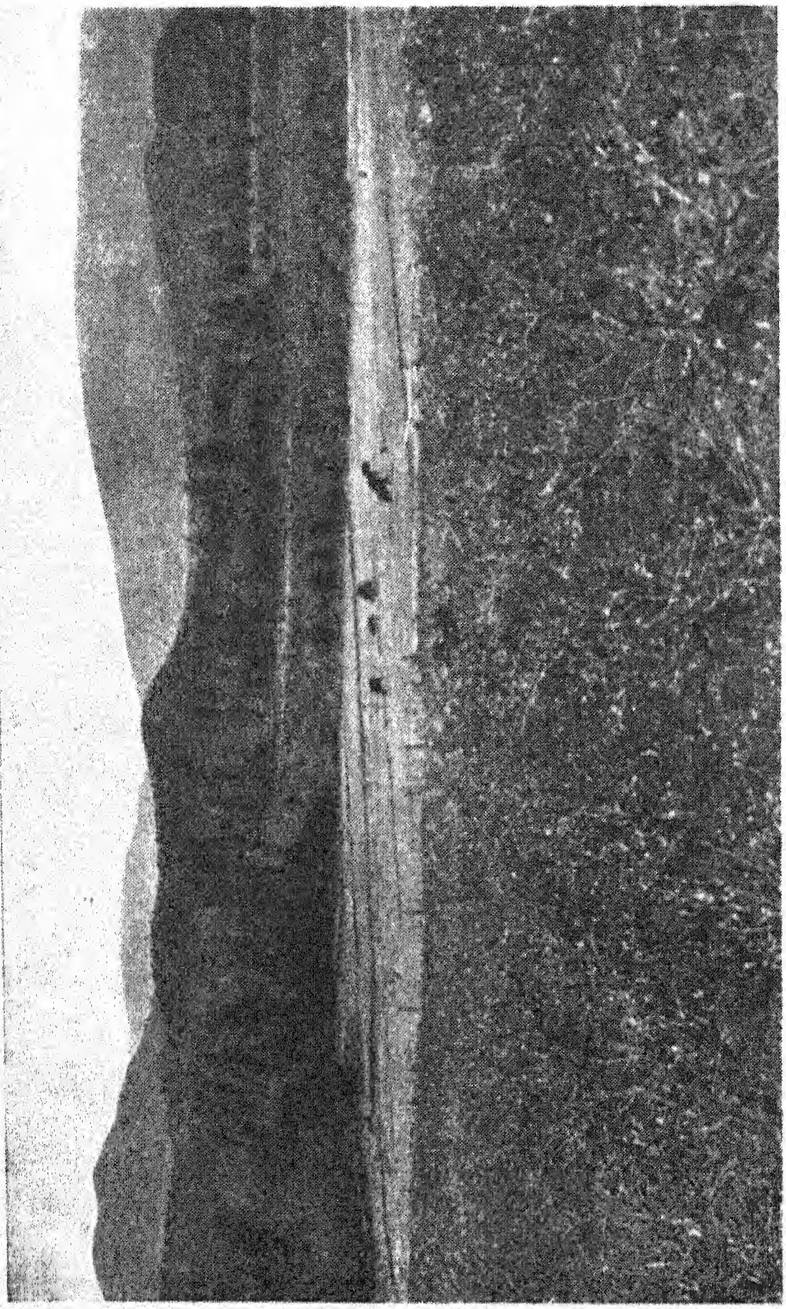
"(6) (3) Any wool that has been repacked must be clearly marked 'Repacks' and the repacker's name and address must appear on the bale."

The first-mentioned regulation is of primary importance to the grower. The old packing and marking regulations permitted the non-progressive producer to remove only locks and then to bale fleece wool and bellies and pieces together as long as he marked the containers "unskirted".

Under the new regulation the farmer must remove and pack locks separately, i.e., shankings and wool defiled by urine, dung, excessive sweat or grease, and brand the container "LOX"; and in addition he must keep belly wool and other short extremities of the fleece, including kempy, hairy and matted pieces separate from the fleeces. In other words, during the season commencing August 1942 the producer will be forced to make a minimum of three lines: (*a*) Fleece wool, (*b*) belly wool and pieces and skirts, (*c*) lox.

If long and short bellies and long and short pieces (excluding locks) are baled together, the brand must be "B.P.".

Farmers are advised in their own interests to piece-pick the bellies and pieces thoroughly and divide them into two lines, namely long light bellies and pieces of good colour 1¾ in. and over—brand "C.B.P."—and shorter and dirtier bellies and pieces below 1¾ in. in length—brand "B.P.".



Hooko Valley, Ladismith. With a more reliable water supply this valley is producing record crops.

[Photo: J. [illegible]

Regional Improvement.

J. Joubert, Extension Officer, Ladismith.

THIS article is a brief survey of the efficacy of the Soil-Erosion Scheme with reference to soil and water conservation and its relation to agriculture in the districts of Ladismith, Prince Albert, Barrydale and Montagu.

Ladismith.

Nowhere in the Union has the Scheme been more whole-heartedly supported than in Ladismith (Cape), which also holds the record for the largest number of works completed.

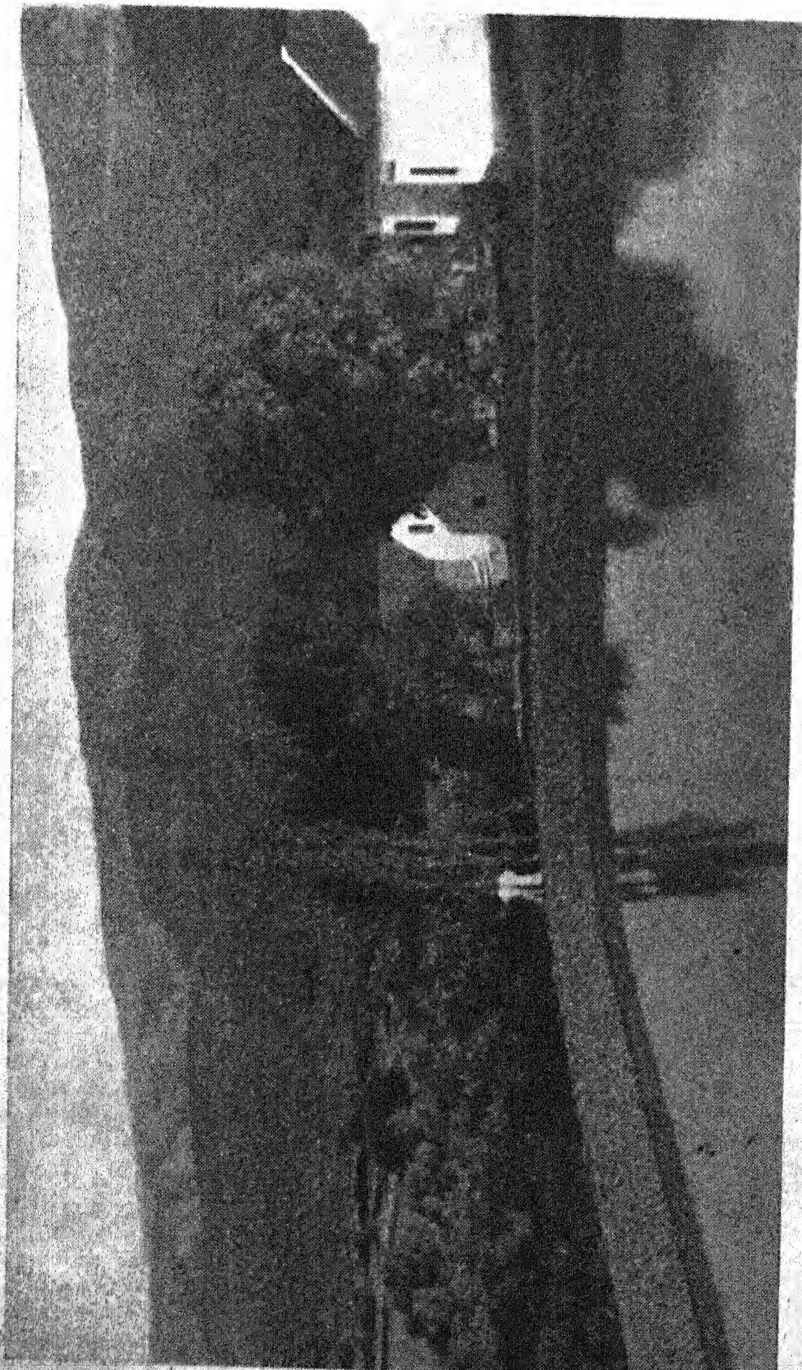
Owing to the scarcity of water during certain critical periods of the year, the scheme was essentially directed towards the conservation of water. For irrigation purposes the majority of works are located in the neighbourhood of the Swartberg range, where viticulture, fruit-growing and field husbandry have reached a high standard of development, whereas the dams intended for supplying drinking water to stock are scattered far and wide over the Karoo veld.

Although the scheme has taken on record proportions, it is to be feared that it has not been applied sufficiently comprehensively to embrace all the vital factors which play an important part in the natural conservation of water and soil.

Ladismith took full advantage of the generous terms of the Scheme and in a measure succeeded beyond expectation. In most cases direct benefits accruing from individual works are apparent at an early stage, but regional improvements with regard to a general increase in the water supply is quite a different story. In this connexion it will be advisable at this stage to mention three specific areas namely Buffelsdrift, Algarynskraal and the lower portions of the Hoeko Valley or Weltevreden.

These areas, although also dependent on the mountain streams, are at the remote end and cannot rely on a steady supply like those farms which are more favourably situated nearer the origin of the streams coming from the Kleinswartberg range. After heavy rains lower farms, of course, got a quota of surplus water, but how much they got and when(was a matter which largely depended on the whims of nature.

When farmers nearer the mountain started building dams by the score, the lower owners became very perturbed and threatened to interfere with operations which were presumably going to rob them of their overflow. Yet the building continued uninterrupted and now after five years decided changes have taken place The inevitable leakage from a certain percentage of the dams, seepage of water under pressure, and irrigation at regular intervals, have combined to arrest the sudden disappearance of flood water and to promote a steady flow which gave these rivers a new lease of life.



Bloemendal, Prince Albert. The dams are proving a great help to the farmers, where success depends upon the available amount of water.

(Photo: J. Joubert.)

We now find that Algarynskraal is producing record crops of wheat, barley and lucerne; at Buffelsdrift the water continues to run after prolonged periods of drought, and in the lower Hoeko Valley the phenomenon is even more striking. These regional changes with reference to a constant water supply are the outstanding achievements of the Scheme and have dispelled the illusion as to the great value of flood water.

Prince Albert.

Most of the dams built in this district are situated along the northern slopes of the Grootswartberg. The majority of the works are solidly constructed, strictly in accordance wih specifications, and are used for irrigation purposes, whereas a smaller percentage on the open Karoo are used for stock-watering.

On the beautiful farms nearer the mountain, conditions are favourable for diversified types of farming. These farms are dependent on many streams coming from the high altitudes with a better rainfall. The dams are proving a great help to the farmers where success is determined largely by the available water supply.

Barrydale.

Situated on the northern slopes of the Langeberg with the Karoo on the opposite side, this area is sharply divided into two regions, but by far the most important agriculural section is that portion which depends on the above-mentioned mountain for its water supply.

During the past decade this community has made most convincing and substantial progress. With a full realization of the potentialities of their soil and climate, the farmers in this brandy-producing and horticultural area are delivering the goods.

The new co-operative distillery and fruit packhouse, both of which came into operation this season, are indicative of progress and hopeful signs for the future.

To-day the farmers rejoice at the benevolent and legitimate share they are getting out of the Scheme. It has given them greater security by ėliminating one of the elements of gamble. Their progress during the past few years may already be coupled with the additional water supply, and in time to come, they are bound to profit even more.

With the clear water coming from the mountains there is no immediate danger that their works will get silted up. With this in view we in some cases recommended and approved of expensive works where dams have been dynamited out of almost solid nabank, but once completed they will remain for many years and no one who understands the situation will consider that money has been wasted. Other farmers, again, with better sites, could accumulate more water for the same amount of money spent.

Rains which blow over from the coast generally give a heavy precipitation on the mountains, and while streams of water are pouring down the slopes it often happens that it does not rain in the valley at all. When these conditions prevail, it is easy to understand the value of the dams. The majority of the farmers have two or three dams, and when these are full, they are safe for many months.

[*Continued on page 46.*

The Townsman and Weed Control.

Roscar du Toit, Professional Officer (Weed Control),
Division of Soil and Veld Conservation.

THE problem of weed control is regarded from totally different points of view by townsmen and city dwellers on the one hand, and farmers on the other. To the former a plant is a weed when it is troublesome or fails to improve the appearance of the garden; to the latter, a plant is undesirable chiefly when it is able to cause damage. The townsman or city dweller, for instance, will pay a great deal of attention to the control of black jacks (*Bidens* sp.) and khaki-bush (*T. minuta*), since the presence of such weeds not only serves as a reflection on his neatness, but also handicaps his efforts to cultivate choice varieties of flowers and detracts from the appearance of the neighbourhood in which he resides. The farmer also finds these plants troublesome and unsightly when infestation occurs in the immediate vicinity of his homestead, but when they grow on old lands, for example, he may find them useful for making compost, and in certain cases they may even serve as a pasture or hay crop.

In towns and cities the bugtree (*Solanum auriculatum*) inkberry (*Cestrum laevigatum*) and hakea varieties (*Hakea* sp.) are quite commonly planted for ornamental purposes, whereas farmers are obliged to do all in their power to get these plants under control. The fruit fly, which is the cause of immense losses to fruit farmers, hibernates in the bugtree. Hakea overruns large areas of veld and renders it useless. During the months of June and July, the inkberry possesses poisonous properties which may cause stock losses.

Dangerous plants such as jointed cactus (*Opuntia aurantiaca*) and imbricate cactus (*Opuntia imbricata*) are frequently found on rockeries, the owners of which are seldom, if ever, aware of the fact that the government has already spent thousands of pounds in eradicating these pests in the open veld. Both these cactus varieties were imported as pot or rockery plants and the responsible persons were quite unaware of the potential dangers which they were introducing. Numerous other plants, such as the American bramble, hakea, the bugtree, water hyacinth, etc., fall in the same category. Fortunately for our farmers, the importation of exotic plant varieties has long since been restricted by the Department of Agriculture and Forestry. Consequently there is not much danger at the present time of further pests of this nature being introduced into the country.

It is clear, therefore, that as far as weeds are concerned the townsman and city dweller's interests are not identical with those of the farmer. Plants which are admired and regarded as harmless in gardens, may be a pest in the veld and must be eradicated there.

Noxious Plants.—In accordance with the Weeds Act, No. 42 of 1937, as amended, the Minister has proclaimed as weeds those

plants which have proved to be most harmful on farms. They are the following:—

1. *All Opuntia varieties* of the cactus family, e.g. the prickly pear, the jointed cactus and the imbricate cactus.
2. *Xanthium varieties.* (Cockleburr and "Boetebossie").
3. *Solanum auriculatum.* (Bugtree).
4. *Cuscuta campestris.* (Dodder).
5. *Hakea sericea, Hakea gibbosa, Hakea suaveolens.* (Hakea varieties).
6. *Cannabis Sativa.* (Dagga).
7. *Cirsium vulgare.* (Spear thistle).
8. *Acanthospermum hispidum.* (Upright starbur).
9. *Solanum sisymbriifolium.* (Wild tomato).
10. *Senecio illicifolius. Senecio Burchellii.* (Locust- or guano-bush. (No. 10 has been proclaimed only in the Cape Province).

On the whole, occupiers of erven are never troubled with large scale infestations of the abovenamed plants; moreover, no great difficulty will be experienced in keeping the comparatively small plots free from weeds. Most of the plants mentioned, however, do not cause the town dweller much concern; those plants which as far as the farmer is concerned are merely a nuisance and unsightly and are consequently not proclaimed weeds, are the town dweller's chief source of trouble. He would like to see khaki-bush, black jacks, the thorn-apple and some others brought under control.

Eradication of Weeds by Municipalities.—In view of these facts, therefore, the Minister of Agriculture and Forestry will consider the proclamation as weeds of additional plants in a municipal area, *provided* the town council concerned submits a request to this effect and undertakes to execute the work at its *own expense* and with the employment of its *own officers* under the supervision if the Division of Soil and Veld Conservation. Up to the present, eleven town councils in the Transvaal have taken advantage of this scheme, and the system appears to be yielding good results. This undertaking involves practically no additional expense for the town councils concerned, since the municipal officers serving notices and carrying out re-inspections, do so in the course of their normal duties.

In the Transvaal, the following list of additional plants have been proclaimed weeds in municipal areas concerned:—

	Botanical Name.	*English.*	*Afrikaans.*
1.	*Bidens pilosa*, Linn........	Black Jack, Beggar Tick..	Knapsekerwel.
2.	*Bidens bipinnata*, Linn.....	Black Jack, Begger Tick..	Knapsekerwel.
3.	*Datura ferox*, Linn.........	Large Stramonium........	Groot Stinkblaar, Stinkolie.
4.	*Datura stramonium*, Linn...	Stramonium..............	Stinkblaar, Stinkolie.
5.	*Datura tatula*, Linn........	Purple Thornappel........	Pers Stinkblaar.
6.	*Argemone mexicana*, Linn...	Mexican Poppy...........	Bloudissel, Meksikaanse Papawer.
7.	*Erigeron linifolius Willd.*...	Horse Weed.............	—
8.	*Acanthospermum australe*, (L) Kuntze	Prostrate Starbur........,	Platgroeiende Sterklits.
9.	*Tagetes minuta*, Linn......	Mexican Marigold.........	Kakibos.
10.	*Schkuhria bonariensis*, H. & A.	Dwarf Marigold..........	—

Wtih the exception of the Prostrate Starbur (*acanthospermum australe*), all the above-named plants are annuals, are propagated from seed and can be controlled comparatively easily by uprooting,

hoeing, or by ploughing or digging them into the soil, according to circumstances. The application of control measures should be commenced in good time, i.e., before the seed has set, otherwise re-infestation and further spreading of the weed will take place.

The perennial Starbur is propagated from seed and also by means of shoots which very readily form roots. Consequently, the best method of control in the case of this weed, is repeated cutting of the plant below the surface of the soil and burning of the surface material after it has become dry. In this way, with the root system gradually becoming exhausted, the plant can be brought under control. Repeated spraying with solutions of arsenic pentoxide, iron sulphate and copper sulphate may also be tried, but on occupied erven it is safer and more effective to hoe and burn the plants.

Further information in connection with weed control may be obtained on application from tthe Chief, Division of Soil and Veld Conservation, P.O. Box 965, Pretoria. Municipal Councils interested in the proclamation of additional plants in their areas, should also communicate with the above address.

Tobacco in Oudtshoorn—

[*Continued from page 8.*

average annual production has been practically doubled in that period, flue-curing has not progressed to any extent, especially when compared with the position in other areas such as the Gamtoos, Rustenburg, Brits and Potgietersrust areas, where the number of flue-barns now total about 2,500.

When the present position is compared with that of ten years ago, one is struck by the progress which has been made. Instead of the many varieties and some very mixed and non-descript types which were grown in 1930 and lacked uniformity, the few standard varieties now grown show great uniformity. Formerly, practically the whole crop was dark and heavy, and was used principally for roll and pipe tobacco. Today, however, nearly half the crop is light coloured and much of it is suitable for the manufacture of cigarettes and light pipe mixtures. As light-coloured leaf fetches a much higher price than dark leaf, the financial returns from tobacco are naturally considerably higher, pound for pound, than formerly.

The curing sheds have been improved considerably and so have the methods of soil preparation, manuring, seedbed making, etc.

The experimental plot at Oudtshoorn was largely responsible for the improvement of types and varieties. Considerable amounts of selected and purified seed are sold annually to the growers in the surrounding areas and the guidance given to the individual growers by the Government tobacco officer stationed at Oudtshoorn is of inestimable value in sustaining interest in better methods of tobacco farming.

The Processing of Wool.

J. C. de Klerk, Sheep and Wool Officer, College of Agriculture, Glen, O.F.S.

SOUTH AFRICA is showing an ever increasing interest in the establishment of woollen mills. We certainly have the raw material and the conditions, but the question of markets, which is the most vital consideration, is an open one. However, it is not the object of this article to go into the question of markets for the

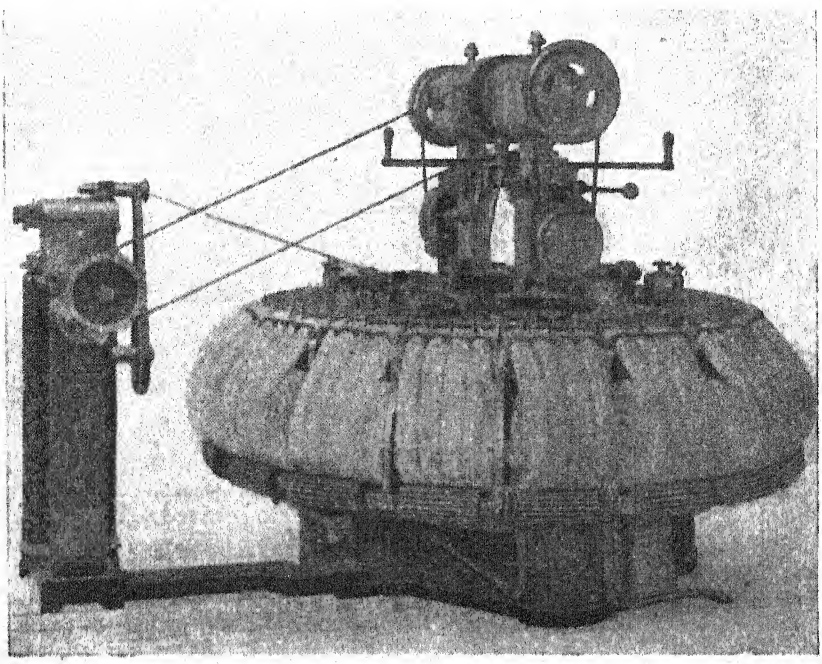


Fig. 1.—An Improved Comb.

manufactured materials but merely to give those who know nothing about the subject a rudementary idea of wool manufacturing. Furthermore, since the organization of the wool textile industry has an extremely important bearing on the marketing of wool, it is necessary that producers should understand it thoroughly.

Viewing the textile industry very broadly, one is struck by its extreme sub-division. There are very few mills overseas which handle wool from the raw state to the finished article, but each concern plays only a part in the long process of manufacture. First of all we have the wool merchants, buying and selling wool to the manufacturers, combers or topmakers. Secondly, we have the

topmakers, who buy wool, sort and blend it, and prepare or card the wool into tops. Thirdly, we have the commission combers who comb wool for those topmakers who do not possess combs. Fourthly, we have the spinners who buy the tops and make them into yarns. Fifthly, we have the weavers who buy the yarn from the spinners and weave the cloth. Sixthly, we have the dyers and finishers who scour and dye the finished cloth, usually on a commission basis. Lastly, there are the distributors or wholesalers.

Sorting.

The first process in manufacture is wool sorting. This work is done by highly skilled men with a long training, and it is their job to sort the wool into its various lengths and qualities. This work is done on a "piece-work" basis. Sorting into qualities is not too difficult, but sorting for length is a very arduous job. The better the wool is classed in the shed, the greater the amount of wool that can be sorted in a given time. These operatives are therefor paid on a much lower basis for well-classed clips and proportionately much more for badly classed clips.

Blending.

After sorting we get *blending*. This is done by mixing wools from various sources to secure a material which will have certain properties, or to produce certain effects. The price factor is also most important. Thus, at different mills we may get a straight line of Australian or Cape wool, or the two blended in various proportions. It is also popular to blend in certain quantities of similar quality South American or Canadian wool.

Scouring.

After blending the wool is scoured, but where there is an abundance of seed, such wool must first be carbonized. This is done by treating the wool with dilute sulphuric acid. Excess moisture is then driven off by super-heating which also causes the burs to carbonize. By the aid of crushing rollers and shaking, the carbonized burs are then easily removed. This extra process of carbonizing costs somewhere near 1d. per pound. After carbonization the wool is ready for scouring.

The most popular method is the alkaline-emulsion scouring system. The machine consits of a series of steeping bowls, containing hot water, soap and alkali. Any over- or underwash produces bad effects on the subsequent processes of manufacture. Besides, the wool can be irreparably damaged by too much heat, agitation or alkali.

Rams' wool and heavy-conditioned wools always require much more severe scouring to rid them of that extra yolk or grease. Depending upon the amount of grease, sand, dirt, etc., the cost of scouring varies from ½d. to 1d. per lb.

There are also other systems of scouring, such as dessuinting, the solvent system and the Du Hamel process. The latter uses the natural suint of the wool itself as a detergent.

Following on scouring is drying of the wool. This is done in drying machines by the aid of a steady blast of hot air.

By-Products.

The scouring mills have important by-products which can be reclaimed. One of these is the wool grease or fat which, when refined, is called lanoline and forms the basis of many ointments. The wool oil is further used for making soaps and candles, oils, lubricants, printing inks, shoe polish, varnishes, etc.

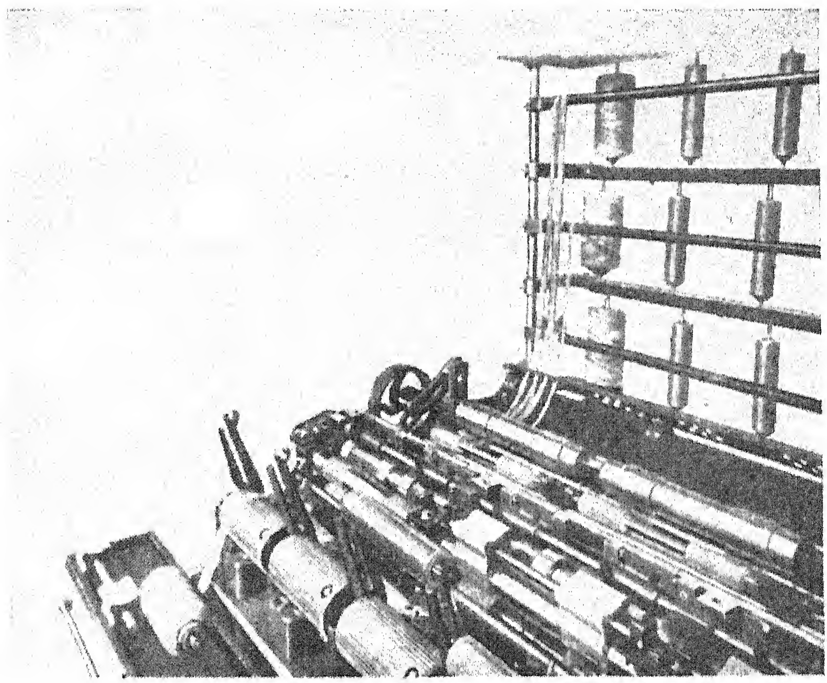


FIG. 2.—Close up view of a Porcupine Drawing Box, showing passage of sliver through the machine.

The other important by-product is potash salt. Potash salt is the most important components of the suint and, when reclaimed, can be made into ordinary potash fertilizer.

The Woollen and Worsted Industries.

Up to the scouring stage, all wools are treated alike, but then an important differentiation is made, as follows: All the short wools find their way into the woollen industry and all the long wools find their way into the worsted industry. Two inches is the approximate demarcation line. In the worsted industry there is a further sub-division: all wools above 8 inches are "prepared" and those below 8 inches "carded". This differentiation is extremely important as the two systems differ widely as regards processing, cost,

raw material used, yarn structure and the finished article. The most important points of difference are the following:—

The woollen industry has a vast source of raw materials to draw upon since it can employ short wools from the very highest quality down to the very lowest quality Persian and Indian wool. It also uses admixtures of cotton, silk, woollen noil, woollen wastes, tender wool and wool recovered from rags, etc. The industry produces fabrics of the very finest quality in the world, down to the very lowest and coarsest. It is directly opposed to the worsted industry, as it requires short fibres and can spin anything with two ends. The yarn has no definite structure—it is just an intermingling of fibres with no parallel relationship between the compenent fibres. The resultant cloth has a bulky and woollen appearance and the weave structure is obscure.

Another important difference between woollen and worsted industries is that in the former the wool is not combed and the raw material passes through only about 5 to 8 operations before it is ready to be woven into cloth.

The worsted industry uses only sound pure virgin wool of good length. The worsted yarn, before being spun, goes through at least 18 to 25 operations, all being designed to get a smooth level yarn. The resultant cloth shows a smooth finish on the surface and the weave can be clearly seen. This is made possible by the fact that only the long fibres are used, the short fibres or noil being rejected by combing. The fibres in the yarn itself all have a parallel relationship.

The processing into yarn and cloth subsequent to scouring is now shortly as follows:—

Carding.

After scouring and drying follows carding. The woollen card differs in various ways from the worsted card, but the main principle employed in both is the same, namely, opening up an entangled mass of fibres, laying them in a roughly parallel formation, and ejecting them in a continuous and even sliver formation. On the last machine of the woollen card the sliver is separated into a number of threads or rovings which are bound on to bobbins ready for spinning on the mule and subsequent weaving.

Carding is a very delicate process and it is impossible to overestimate the amount of care that should be taken in every detail of this process.

Preparing.

The worsted carding machine is not suitable for all kinds of wool, as wool with a very long staple is apt to get broken in the cards. Such wools are "prepared" (commonly called the "English" or "Bradford" system of working). Preparing consists in passing the wool through a series of gill boxes which, by means of moving combs or "fallers", separate and straighten out the fibres and ultimately present them in a form suitable for combing.

Backwashing.

Attached to the worsted carding machine, there is the backwasher which give the wool a second cleaning. This second

cleaning is necessary to remove dirt not previously removed in the original scouring, and to remove dirt that has been set free as a result of the carding action. At this stage also oil can be added (usually olive oil) for "oil-combed" tops, and if necessary "blueing" can also be done.

Combing.

The carded or prepared sliver is finally ready for combing. This is a vital process, for it is here that the fibres are finally straightened

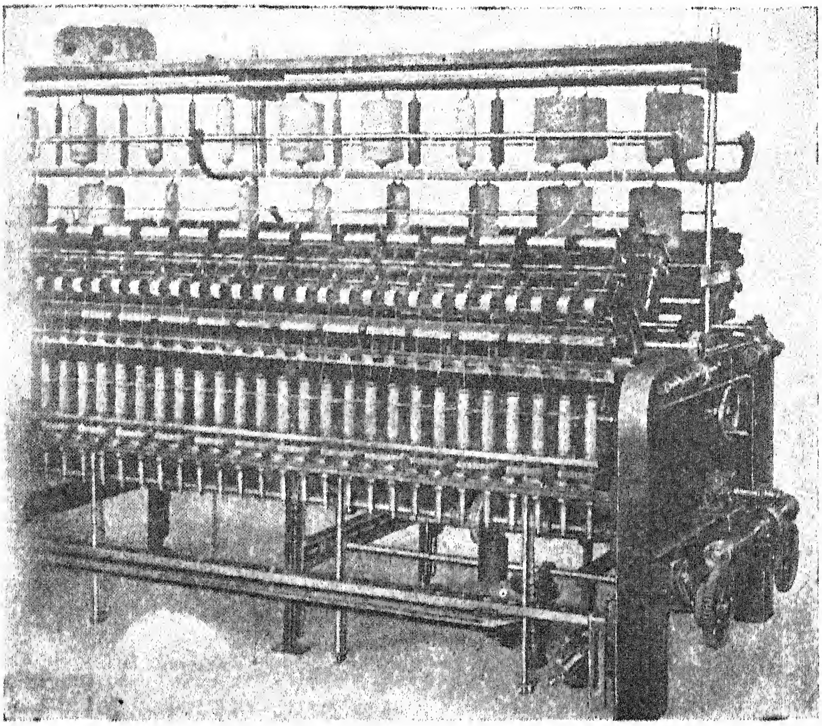


Fig. 3.—Ring Spinning Frame. French System. Double-sided, with Spindles and Tapes and Tension Pulleys.

out and the short fibres separated from the long ones. There are different types of combs.

"Top" and "Noil".

In the comb the short fibres rejected are called the "noil" and the long fibres the "top". The proportion of top to noil is called the "tear" of the wool, and the buyer of raw wool has to estimate this tear by examining the raw wool. By estimating the shrinkage of the greasy wool during the process of scouring and the tear of the wool, he is able to calculate the price that he will be justified in paying. The combing tariff varies according to the tear; thus, with a good shafty Merino wool giving a tear of say 5:1, the cost of

combing is about 3⅞d. per pound, whereas in the case of a wool with a tear of 3:1, the combing cost is about 5½d. per pound. To obtain a good tear (and from the producer's point of view the best possible price) the wool must be sound in staple, as all tender or weak fibres will be rejected by the combs as "noil". Most important is that the length should be as uniform as possible, for the combs can be set to comb different lengths of wool, but they cannot work varying lengths of wool at the same time. After a few more operations we get the finished top which is then ready for "drawing".

Drawing.

The term "drawing" is used in the worsted industry to denote the several progressive operations concerned in reducing the top sliver to a thin roving thread suitable for being spun into yarn on the spinning frame. The number of these operations varies from 7 to 10.

Depending on the type and quality of wool, different systems of drawing are employed. The English or "open" system is for long-fibred and cross-bred wools, shafty merinos, mohair, etc. Secondly, we have "cone" drawing which is used for producing high-class coating and hosiery yarns from fine merino and cross-bred wools. These machines, however, are very complicated and expensive, requiring highly skilled attendants. Twist plays an important part in the English and cone drawing systems, and distinguishes it from the French or porcupine system of drawing which uses no twist at all.

Without twist the fibres are free in arrangement, soft to handle and lofty in appearance.

This latter system which is very popular in Europe for working merino wools is undoubtedly the system that will be employed if South Africa should start her own worsted mills.

Spinning.

When, finally, a roving of sufficient thickness has been produced, the wool is spun into yarn according to the desired count. There are no fewer than four different types of spinning frames, all being alike in respect of drafting the roving into yarn form, but differing in the method of inserting the twist on the yarn and in winding it on to bobbins.

Weaving.

The fininshed yarn is used for weaving which consists of interlacing the different threads at right angles to one another, but at the same time, according to a predetermined design. The fibres lying longitudinally in the loom are called the warp and the cross threads the weft. For the warp yarn only the best wool is used, and it must be absolutely sound because during the whole process of weaving the warp is always in a state of tension. If all the fibres are not sound, breakages will occur with the result that soon the warp threads will not open clearly in shedding; consequently they will be broken or passed over instead of under by the weft, causing an imperfect cloth.

Burling and Mending.

When the cloth leaves the loom it is in a more or less imperfect condition owing to various causes. All the faults are marked by a specialist and the cloth is then passed on to the next process of burling and mending. The burler takes out all the lumps and curls and the mender sews in all broken threads, etc.

Dyeing and Finishing.

The very last process is that of dyeing and finishing. This briefly consists of blowing steam through the fabric to set the threads, scouring with soap to take out all grease marks, and shearing off all stray fibres from the face of the cloth. The fabric is then dyed and afterwards pressed. Later it is wrapped up and usually sent direct to the merchant, who in turn sells to the retailer.

Felting.

It is of interest to note that fine merino wool can be made into cloth without first being spun into yarn. The " felt " material so obtained is commonly used for making felt hats. It is usually made from films of wool which are laid on top of one another after the carding process. When the desired thickness is obtained, the films are milled into one compact mass. This is brought about by pressure and friction in a soapy solution which acts as lubricant.

REFERENCES.

" The Worsted Industry " by J. Dumville and S. Kershaw.
" The Marketing of Wool " by A. F. du Plessis.

Nursery Quarantines.

The following nursery quarantines were in force on 1 December, 1941 :—

Alkmaar Estates, Alkmaar on citrus (all), for red scale.

Municipal Nursery (Fountains), Pretoria, on ornamentals (part), for pernicious and white peach scales.

Kildare Nurseries, Pietermaritzburg, on apples (part), for red and pernicious scales.

Subkleve's Nurseries, Bryanston, Johannesburg, on deciduous fruit trees (part), for pernicious scale .

The Pollock Nurseries, Johannesbrug, on deciduous fruit trees and ornamentals (part), for pernicious and red scales and Araucaria mealy bug.

Science Bulletins.

(1) Dinitro-orto-cresol and other Insecticides as Locust Poisons: Experiments of 1938-39—Science Bulletin No. 232. Price 6d. Obtainable from the Chief, Division of Chemical Services, Pretoria.

(2) The Story of Wattle (or Mimosa) The World's Modern Tanning Material. *Science Bulletin No. 168. Price 3d. Obtainable from the Chief, Division of Chemical Services, Pretoria.

Codling-moth Control.

A Preliminary Experiment conducted in the Langkloof Valley, Cape Province.

H. J. Bishop, Entomologist, and Dr. V. Reinecke, Horticulturist.

THE Langkloof in the eastern Cape Province now ranks among the chief apple-growing areas of the Union, and in common with most other areas it has its codling-moth problem to contend with.

The control of this pest has called for greater vigilance and attention each succeeding year. Unfortunately, fruit growers in the Langkloof have had no locally tested spray programme for codling control to guide them in the past.

The Spray Programme.

During the 1940-41 season a tentative spray programme was drawn up and officially tested in this area. Only two spray treatments were used, viz., " A " arsenate of lead spray throughout, and " B " three arsenate of lead sprays followed by " Black Leaf 155 " (fixed nicotine) for the later applications. Lime-sulphur was added to the arsenate of lead sprays and wettable sulphur to the " Black Leaf 155 " applications for the control of Fusicladium disease.

The proportions of the chemicals used were as follows:—

(1)	Arsenate of lead	4 lb.	per 100 gallons of water.
	Spreader	4 oz.	
	Lime-sulphure	from 2 gall. to 7 pints.	
(2)	" Black Leaf 155 "	6 lb.	per 100 gallons of water.
	Wettable sulphur	6 lb.	

There were six plots or replicates each for treatments " A " and " B ", and four control or check plots that received no treatment, marked ,, C ". The " B " treatment was used in order to eliminate the acid-tank washing and hand-cleaning of fruit for arsenic removal at picking time which are usually necessary when the " A " programme is applied and naturally increases the cost of production and the risk of injury to the fruit.

Sulphur spray applications for Fusicladium control were started early in October, and in the case of lime-sulphur the sprays were applied in varying quantities according to the time of year and the condition of the trees.

The Different Treatments.

The " A " plots received lime-sulphur sprays on the following dates at the dilutions given, viz., 8 October (not quite green-tip

stage) 1-30; 21 October (green-tip stage) 1-40; 5 and 13 November 1-50; 25 November 1-80; 12 December 1-100; 2 January 1-120.

The "B" plots were sprayed with lime-sulphur 1-30 on 8 October and thereafter with wettable sulphur at the rate of 6 lb. per 100 gallons of spray solution at each treatment on 21 October, 5, 13 and 25 November, 12 December, 2 and 15 January. All these sprays from 5 November were in combination with the codling-moth treatment.

The first codling-moth sprays were put on at half blossom drop, and the "A" plots received a total of six arsenate-spray applications, on the following dates.—5, 13 and 25 November, 12 December, 2 January and 3 February. The "B" plots received three arsenate sprays on the same dates in November as the "A" plots, followed by five "Black Leaf 155" applications on 2 and 12 December, 2 and 15 January and 3 February.

A wheelbarrow spray pump with a tank capacity of 14 gallons was used for the work. This is a type of pump easily worked and moved about by hand in the orchard, and is popular with the small orchardist whose trees are not too big, and who has to consider the initial costs of such equipment. More powerful hand or petrol-driven pumps would be required for spraying bigger trees in larger orchards.

The cost of spray material at current wholesale prices, allowing the liberal quantity of one gallon per tree at each application, totalled approximately 3¾d. per tree for the "A" treatment and 6d. per tree for the "B" treatment for the whole season. Labour costs would total about ¾d. per tree.

The Results Obtained.

The crop was picked at the end of February and every apple was carefully examined for infestation. The codling-moth infested fruit taken in percentages worked out as follows.—"A" plots 7·92, "B" plots 9·93 and "C" plots 26·88 per cent. The average total yield of fruit per tree, with the exception of one plot that had practically no fruit, was—"A" plots 210 fruits, 'B" plots 230 and "C" plots 201.

In summing up the results of this preliminary experiment, both the "A" and "B" treatments considerably reduced the codling-moth infestation in comparison with that of the untreated fruit. The "A" treatment of six spray applications gave slightly better results at a lower cost than the "B" treatment of eight sprays.

Fusicladium was not bad during the season. Unsprayed trees were affected to a slight degree, but infection on lime-sulphur and wettable sulphur sprayed trees was negligible, so that no difference between the two treatments could be noted.

Wettable sulphur spray controlled Bryobia mite more effectively than lime-sulphur.

These results and conclusions are by no means final and the investigations are being continued.

The History of the Turkey.

E. F. Lombard, Professional Officer (Poultry), East London.

ALL varieties of the domestic turkey originated from the wild breed in Northern America where the earliest settlers found it roaming wild in large numbers. As can be expected, the breed received a measure of protection and to this day smaller numbers may still be found in the wild state in remote parts of that country.

It is believed that two varieties of wild turkeys were found in the more northern parts of America and Canada and in the Southern States and Mexico. In Honduras and Central America, a second species was found, known as the Oscellated turkey. It was stated that this variety had no breast tuft and surpassed the other by its iridescent splendour of colour. Although naturalists prefer to class it as a species different from the others, as poultrymen use the technical terms, turkeys are all of one species and, strictly speaking, of one breed, but of many varieties. It is therefore evident that all the different turkey varieties spring from the original wild American stock, selective breeding and difference in climatic conditions and environment having been largely responsible for the presence of the many colours and types of to-day. This no one questions and it corresponds with the history of the domestic hen.

In about the year 1500 the Spaniards took birds from Mexico across the Atlantic Ocean and domesticated them in the Spanish Peninsula, whence they spread over Europe. In about 1550 turkeys were first introduced into England.

It is interesting to note that prior to this period the peafowl (peacock) played the same rôle in the Christmas menu in England as the turkey does to-day.

In the years 1656 and 1657 turkeys and swans were first introduced into South Africa from Holland. These birds were sent to Jan van Riebeeck at Cape Town by the Dutch East India Company, chiefly for the purpose of sending some of their progeny to Batavia and India to be used there as curious presents in the interests of the Company.

It is therefore reasonable to assume that the earliest settlers in the Cape obtained and bred some of these birds, and in this way, as the settlers moved inland, turkeys became established in South Africa.

Popular Bulletins.

(1) Calf Rearing—Bulletin No. 224. Price 3d. Obtainable from the Editor, Department of Agriculture and Forestry, Pretoria.

(2) The Export of Fresh Grapes from the Union of South Africa during the Ten-year perid, 1930-39—oBulletin 225. Price 6d. Obtainable from the Chief, Division of Horticulture, Pretoria.

(3) Soft Cheese as a Food—Bulletin No. 229. Price 3d. Obtainable from the Editor, Department of Agriculture and Forestry, Pretoria.

Do Pastures Pay?

A Natal South-Coast Farmer's Experience.

D. J. Gardner and J. E. Pons, Extension Officers.

PASTURES have become very prominent in the southern Natal farming pattern and the question is often asked: "Do pastures pay?" Unfortunately accurate figures of costs and profits are not often available. On the one hand, the farmer often suspects the figures provided by Government Institutions because he contends that they have been obtained with "Government Money" and regardless

of expense. On the other hand, it is quite natural that private farmers are reluctant to reveal details of their financial undertakings.

In order to throw more light on the subject and at the same time to demonstrate the growth and management of established pastures under practical conditions along the coast, a co-operative demonstration was laid down on Rothenberg, the farm of Mr. Joh. Voigts, Izotsha. Mr. Voigts has been kind enough to supply the figures quoted in this article. He keeps accurate records of all his transactions and the figures given below can be depended upon to give a true reflection of the actual state of affairs.

Description of the Farm.

Rothenberg is situated about three miles from the sea. The soil on this farm is a poor sandy soil, typical of the coastal region. The natural vegetation, characteristic of the area, is poor and of coarse nature. Grass varieties commonly found are *Eragrostis curvula*, *Eragrostis superba* (umchiki and kindred varieties), *Sporobulus* species (sourgrass) and aristidas (mgongoni or wiregrass) on the slopes, with panicums (buffelgrass) and *Digitarias* (fingergrass) in the lowlying and more fertile spots, with very little *Themeda triandra* (red or bluegrass). Samples of the grazing have been analysed and found to be deficient in phosphates, calcium, and protein.

Mr. Voigts is a dairy farmer and supplies milk to the South Coast hotels. The demand varies with the influx of visitors. The surplus milk is sold as cream or butter.

The herd consists of Grade Frieslands with an average milk production of 1½ to 2 gallons per cow.

The Demonstration consits of 20 acres of pastures of the following grasses: 12 acres *Paspalum dilutatum;* 4 acres Rhodesgrass; 2 acres Kikuyu; 2 acres Napier fodder.

In order to allow for rotational grazing, seven paddocks have been established, four of paspalum and one of each of the other grasses. Shade and water are provided in each paddock.

The pastures were established towards the end of the 1938-39 summer at the following cost for the 20 acres:—

	£	s.	d.
Ploughing (oxen @ 2/8d. per acre	2	16	0
Harrowing (3 times) at 4½d. per acre	1	3	7
Seed	20	7	0
Seeding and rolling	1	2	6
Fertilizer (at sowing time) 2 tons each of rock phosphate and super	15	10	0
Weeding by natives with hoe	22	7	6
Fencing	18	10	0
TOTAL	£81	16	7

The pastures were well established in October 1939 and grazing commenced on the 22nd of that month. The grazing was done rotationally on the seven paddocks with 54 dairy cows and the milk yields recorded twice daily. The acreage of pastures available was too small for the herd, with the result that the cows had to be taken off periodically to allow the pastures to recover.

The cows were fed a certain fixed amount of hay and concentrates each day, irrespective of whether they were on pasture or veld, and the feeding was gradually increased as the season advanced.

Rainfall Records.

The rainfoll records for the two seasons were as follows:—

At Purbeck (20 miles away):—

1939	June to Sept.	5·2″
,,	Oct. to Dec.	12·2″
1940	Jan. to March	4·0″
,,	March to June*	10·2″
Total		31·6″

Izotsha School:—

1940	Sept.	0·47″
,,	Oct.	1·20″
,,	Nov.	4·29″
,,	Dec. (Not registered.)	
1941	Jan.	0·21″
,,	Feb.	0·15″
,,	March	0·67″
,,	April	2·64″

* 8″ in May.

Unfortunately no records of other places or of previous seasons are available.

Not only was the total rainfall very much below normal (Port Shepstone district enjoys an average rainfall of 35 inches to 40 inches per annum), but the periods between the showers were very long. It will also be noted that in both seasons there was a very low precipitation from January to April.

Grazing Results.

As already stated, the milk yield was recorded twice daily. The number of grazing days and the number gallons of milk obtained from cows on the pastures for the two seasons are reflected in the following tables:—

1939-1940 Season.

Month.	Paspalum.		Rhodes.		Kikuyu.		Napier.	
	Days.	Galls.	Days.	Galls.	Days.	Galls	Days	Galls.
October	6	—	4	—	—	—	—	—
November	12	1,635	2	545	4	368	3	288
December	12	1,144	—	—	2	188	2	191
Januarie	22	2,006	4	371	—	—	4	370
February	10	723	4	285	—	—	2	163
March	17	1,168	4	270	3	202	2	201
Total	79	6,676	18	1,471	9	758	13	1,213
Galls per acre		556		368		379		606
Galls. per day		84·5		81·1		84·2		93·3

Average for pastures combined: 505·9 galls. per acre, 84·3 galls. per day, 101,189 galls. in 119 days.

1940-41 SEASON.

Month.	Paspalum.		Rhodes.		Kikuyu.		Napier.		Veld.		Average daily yield on	
	days	galls.	days	galls.	days	galls.	days	galls.	days	galls.	pastures.	veld.
October......	—	—	—	—	—	—	—	—	31	2,494	—	80
November...	13	1,205	—	—	3	261	3	249	11	875	90	79
December....	15	1,435	5	470	5	476	3	284	3	271	95	90
January.....	10	966	—	—	2	193	3	290	16	1,110	96	88
February....	9	805	3	270	2	176	3	268	11	845	89	77
March.......	12	878	—	—	—	—	—	—	19	1,181	73	62
April........	12	902	3	223	2	150	—	—	13	883	75	67
TOTAL...	71	6,191	11	963	14	1,256	12	1,091	104	7,959		
Galls. per acre		517		240·7		628·0		545·5				
Galls. per day		87·2		87·5		89·7		90·9		76·5		

Galls. per acre (pastures combined) 4·39 galls.; (Veld) 0·25 galls.
Average for pastures combined: 9,501 galls. in 108 days, i.e. 475·5 galls. per acre and 87·9 galls. per day.

Two tons of hay were cut from the Rhodesgrass paddock and during May the Kikuyu and the Napier fodder paddocks could each still provide a few days' grazing.

Comparisons.

In glancing through the above figures one may want to compare the different pastures as regards their carrying capacity and productiveness. Before doing so, however, the following have to be taken into consideration:—

The paspalum was sown on virgin veld on which a catch crop of potatoes had been planted the previous season. The potatoes received a liberal dressing of fertilizer and manure. This, by the way, is an ideal method of establishing pastures. The farmer gets a good crop of potatoes and the soil is at the same time brought to a high degree of fertility, especially as regards humus, which is so necessary for pastures.

The Rhodesgrass was established on virgin soil just ploughed up and harrowed. It had a good stand but did not provide the growth one would expect.

The Napier fodder was planted on an old maize land and incidentally received no top-dressing during the 1939-40 season.

The Kikuyu paddock, on the other hand, is situated below the cow byres, and the rain water flowing from there on to the paddock, helps so provide the nitrogen so necessary for Kikuyu.

Each grass received a different treatment and it is therefore not fair to compare them.

The Paspalum was affected most by the drought. Although patches on the south-westerly aspect were luscious and green, patches on the north-easterly aspect showed signs of drying up. With a normal rainfall season, therefore, the paspalum would have shown up much better during the second season.

The Napier fodder however, seemed to thrive in spite of the drought.

It may therefore be concluded that although on a certain farm, a certain grass may do better than another, all the four mentioned grasses have a place in the pastures along the coast.

Milk Yields on Veld and Pastures.

How the pastures and the veld respectively affected the milk yield is shown in the following table:—

Period on veld.	Period on pasture.	Increase or decrease (galls.)
1-10-40—11-11-40	12-11-40—23-12-40	from 80 on veld to 96 on pasture.
16- 1-41—31 -1-41	1- 1-41—15- 1-41	from 97 on pasture to 82 on veld.
18- 2-41—19- 3-41	1- 2-41—17- 2-41	from 90 on pasture to 61 on veld.
18- 4-41—30- 4-41	29- 3-41—17- 4-41	from 75 on pasture to 65 on veld.

When changed from the pastures to the veld, the cattle seemed to welcome the temporary change of diet and in consequence made better use of the veld than they would have done otherwise. The residual effect of the higher feeding value of the pastures also tended to keep up the high daily yield for a short time when the cows were put on the veld again. This high yield, however, soon fell to the figures shown in the accompanying table.

A typical example of what took place is reflected by the daily yield from February 17th to March 18th. On February 17th the cows were still on pasture and the daily yield varied between 88 and 90 gallons. From February 18th the cows were on veld and the yield decreased as follows: 85, 84, 80, 79, 78, 76, 76, 74, 73, 71, 69, 67, 66, 63, 62, 61 and then varied from 61 to 62 until 18th March when the cows were put on to the pastures again. It can therefore be safely assumed that if the cows had not enjoyed the rotation on the pastures, the average daily yield on the veld would have been much lower.

Although there was not such a marked difference as regards the average daily yield between the pastures and the veld, there was no comparison between the yields per acre. The cows grazed on 300 acres of veld but on the 20 acres of pasture they yielded considerably more milk than on the 300 acres of veld. As indicated in the above tables, the average daily yield per acre on the pastures was nearly 18 times as great as the yield from the veld.

Pastures should therefore play a larger rôle on the smaller farms with limited grazing. The carrying capacity and productiveness of such farms could be increased considerably by the establishment of pastures.

The Financial Aspect.

Depending on the demand at the South Coast hotels, the price of whole milk varied, part of each month's production being sold as such and the rest either as cream or butter. The prices per gallon therefore varied from month to month. The prices during the months October 1939 to March 1940 were as follows:—

1939-40 SEASON.

		£	s.	d.
Gross returns from pastures alone.				
October–November........	2,836 galls. @ 6½d.	76	16	2
December................	1,523 galls. @ 9½d.	60	5	8
January.................	2,747 galls. @ 11d.	125	18	1
February................	1,171 galls. @ 10d.	48	15	10
March...................	1,841 galls. @ 10¾d.	82	9	2
	10,118 galls.	£394	4	11
Expenditure.				
Annual redemption on establishment costs putting life of pastures at 3 years (⅓ of £81. 16s. 7d.)		27	5	2
Fertilizer applied 1939–40		11	6	9
Supplementary feed for 4 months		86	19	0
Labour and transport for 4 months (milking, distribution of milk, feeding, etc.)		60	0	0
Interest on capital, 5 per cent. on £1,000 for 4 months nominal value of live stock, cowbyre, silos, etc.)		16	13	4
		£202	4	3

Thus, for the season 1939-40 the pastures showed a net credit balance of £192 0s. 8d. or £9 12s. per acre.

1940-41 Season.

Proceeds of milk obtained from pastures.

		£	s.	d.
November....	1,715 galls. @ 5¾d.	41	19	
December....	2,665 galls. @ 9d.	99	18	9
January.....	1,449 galls. @ 11d.	66	8	3
February....	1,519 galls. @ 9½d.	60	2	6
March.......	878 galls. @ 10½d.	38	8	3
April.......	1,275 galls. @ 11d.	58	8	9
	9,501	£364	8	3
2 Tons of Rhodesgrass hay @ £1. 10s. 0d.		3	0	0
Total Proceeds		£367	8	3

Expenditure.

	£	s.	d.
Annual redemption on establishment costs (⅓ of £81. 16s. 7d.)	27	5	2
2 Tons grass fertilizer @ £6. 10s. 0d.	13	0	0
1 Ton amm. sulphate @ £12. 13s. 6d.	12	13	6
2 Tons super @ £4. 5s. 4d.	8	10	8
Cost of distributing fertilizer twice	2	5	0
Mowing 4 times	2	15	0
Weeding by hand	10	15	6
Labour and transport (feeding, milking, distribution) for 3½ months	63	0	0
Cost of concentrates for 3½ months	69	16	2
Interest on Capital (5 per cent. on £1,000 for 3½ months)	14	11	8
	£224	12	8

This season's net profits were therefore £142 15s. 7d. or £7 2s. 9d. per acre.

Sales of Cream and Butter.

Even when selling milk at 6½d. per gallon, which is a fair value of milk when selling cream or butter (Underberg cheese factory paid a little over 7d. per gallon for cheese milk last year) the net profit during the first season would have been £71 13s. 4d. and during the second season, £32 12s. 8d.

It must be borne in mind, however, that Mr. Voigts caters for the Coast milk trade, which is at its peak during the winter vacation. Most of his cows therefore calve in winter when the milk flow sometimes increases to 100 gallons a day.

If he had been selling cream or butter, his cows would have calved in spring with a corresponding increase in the summer flow of milk. He would have fed less concentrates and the expenditure in connexion with labour and transport (early milking and distributing milk in town) would also have been considerably decreased. Under the latter conditions a much more favourable credit balance would have resulted.

Comparing Pastures with the Veld.

	£ s. d.	£ s. d.
Pastures.		
Proceeds of milk obtained in 108 days................		367 8 3
Expenditure connected with pastures:		
Annual redemption..................	27 5 2	
Fertilizer..........................	34 4 2	
Distributing fertilizer................	2 5 0	
Weeding and mowing................	13 10 6	
5 per cent. on £100 (20 acres @ £5) for 3½ months......................	1 9 2	
	£78 15 0	78 15 0
GROSS PROFIT...........................		£298 13 3

	£ s. d.
Veld.	
Proceeds of milk obtained from veld in 108 days........	299 17 11
5 per cent. on £1,500 (300 acres @ £5) for 3½ months.....	21 17 6
GROSS PROFIT...............................	£278 0 5

Thus, even without taking into consideration extra expenditure connected with the veld, e.g. cost of fencing, making fire-bands, burning, herding cattle a further distance every day, etc., in the season under review, the 20 acres of pastures produced better results than 300 acres of veld.

In spite, therefore, of the increased cost of labour, concentrates and fertilizer on the one hand, and a decreased production of milk due to abnormally dry years on the other hand, quite a handsome profit was obtained from these pastures.

Biggest Items of Expenditure.

In analysing the figures on the expenditure side, a few points perhaps need comment. The biggest items in the cost of establishment and upkeep of these pastures were seed, fertilizer, and weeding, mowing, and fencing.

Seed.—Although the price per lb. was rather high, it must be pointed out that cheaper seed generally has a much lower germination percentage, so that a higher rate of sowing has to be applied and even then the resulting stand is often unsatisfactory. It therefore pays to get good seed. Once a farmer has established a certain acreage, however, he can harvest his own seed and reduce this item of cost considerably.

Fertilizer.—This is usually an expensive item in pasture work. In areas suitable to their cultivation, grasses respond readily to fertilizer applications, especially nitrogenous fertilizers. Where high yields of milk or beef can be obtained, the expense involved is generally warranted.

Demonstrations have shown, however, that in soils which are of poor texture and deficient in humus, fertilizers often do not seem to have the same beneficial effect as on better soils. It would be advisable, therefore, to improve the fertility and condition of the

soil by proper crop rotations (including a legume) and the application of a green-manuring crop or manure of some kind or other before planting pastures.

As the price of fertilizers and especially that of ammonium sulphate is continually increasing, either of the following procedures may be adopted:—

(*a*) Giving liberal dressings of manure or compost and rock phosphate before establishing and applying less of the more expensive top-dressings afterwards, even if the life of the pasture is thereby shortened.

(*b*) Establishing pastures which can be planted in rows, such as Napier fodder which in this demonstration, gave very good returns.

If necessary manure can be applied between the rows even after establishing and therefore less of the more expensive nitrogen fertilizer is necessary.

Weeding and mowing.—During establishment an amount of £22 7s. 6d. was spent on weeding and during the second season the charges for this item were £13 10s. 6d. This was due largely to the large number of weeds introduced with the manure that was applied to the potato crop and the fact that practically no frosts occur along the coast, which would otherwise have killed the weeds.

The operation of weeding and mowing should never be neglected (as is often unfortunately done) for this may mean the difference between success and failure in maintaining pastures at a high level of productiveness. Especially in the case of paspalum weeding is very important to prevent umcheeki from getting the upperhand. After a number of years, weeding may become useless and then, of course, it is time that the pasture should be ripped up.

Fencing.—This is also very often an expensive item. It must be remembered, however, that such fencing will far outlast the life of the present pastures and could afterwards be used for other pastures or other purposes. The cost of fencing should therefore not be charged against these pastures only.

Conclusion.

In conclusion it may be stated that pastures should play an important part in the farming system along the Coast, especially on small farms with limited grazing, where good milk herds are kept and high prices for milk are obtained.

The best possible care should be given to pastures by paying proper attention to fertilizing, weeding, mowing, etc.

On account of the high expenditure, however, the expense involved would not be warranted unless high-producing milk cows or well-bred beef steers, which will respond readily to feeding, are grazed on the pastures. Even in the same herd only the high producers should be allowed on the pastures, while the lower producing portion of the herd should be fed on less nutritious and cheaper grazing or feed.

To those farmers with limited capital, the advice given is to start on a small scale and extend as conditions allow.

Syringa-berry Poisoning in Stock.

Douw G. Steyn, Onderstepoort.

THE Syringa berry tree (*Melia azedarach L.*) is an indigenous plant of Persia, Syria and Northern India and is planted as an ornamental tree in many parts of the world and also in South Africa. In English it is known as China tree, bead tree, syringa berry tree, Indian lilac, Indian azedarach, White cedar and Cape Syringa and

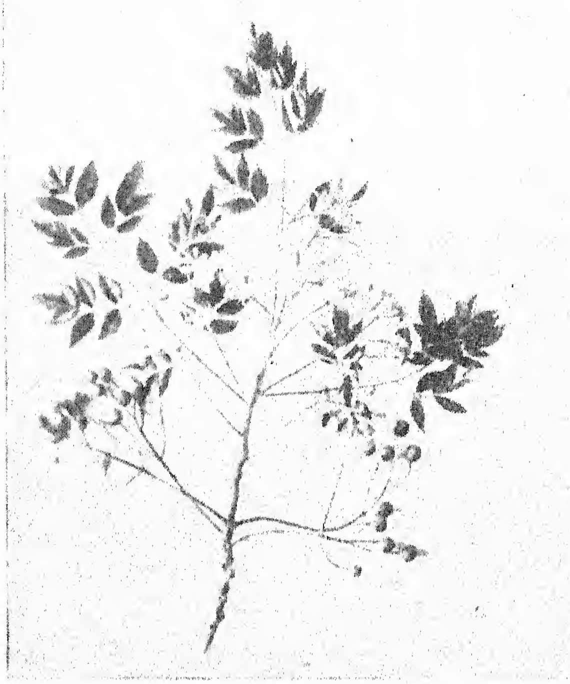
Melia azedarach L.

in Afrikaans as " bessieboom ", " sering " and " seringaboom ". In some parts of the world portions of the tree are used as an emetic, worm remedy and purgative and also for treatment of skin diseases.

The Toxicity of the Tree.

The Arabian name " azedarach ", indicates that the tree is poisonous. The berries are the most poisonous parts of the tree. The flowers are also fairly poisonous and the berries are more poisonous when ripe than in the green stage. The leaves are the least poisonous parts of the plant. It has been determined that the toxicity of flowers and berries on the same tree may vary greatly from year to year. The toxic element of the berry is unknown and, as far as could be determined up to the present, is found only in the outer soft part of the berry while the seed is free from it. Children have been fatally poisoned after eating the berries. Of all animals the pig is by far the most susceptible to syringa berry poisoning. Cases of

syringa berry poisoning have, however, also occurred among sheep, *goats* and cattle, and fowls fed on the berries have been fatally poisoned. Nevertheless, these animals are much less susceptible to the toxic element than pigs. Six to eight ounces of these berries constitute a fatal dose for a pig weighing about 200 lb. Since pigs are very fond of the syringa berry, many losses have been suffered both here in South Africa and in other countries.



Branch of *Melia azedarach L.* with ripe berries.

Symptoms.

The following are the symptoms of poisoning in different animals:—

(1) *Cattle, sheep and goats.*—Restlessness, cramps especially in the muscles of the hindquarters, laboured breathing oppression, quickened and weak pulse, hoven, lack of appetite, general weakness and ultimate paralysis, especially in the hindquarters. The animals usually suffer from diarrhoea if they survive for a few days.

(2) *Pigs and dogs.*—Pigs usually die within a couple of hours after having eaten large quantities of the berries. They usually vomit copiously, and suffer from laboured breathing; their pulse is weak and rapid, and death may be accompanied by convulsions. If they survive for a few days paralysis sets in (especially in the hindquarters) accompanied by severe diarrhoea.

After having eaten of the berries, young dogs have shown the same symptoms as pigs.

(3) *Fowls.*—Fowls are not very susceptible to the toxin. They show signs of listlessness, diarrhoea (usually greenish in colour) and paralysis.

Post-Mortem Lesions.

In the case of animals which survived for some time after having eaten of the berries, there is usually inflamation of the stomach and intestines, degeneration of the liver and haemorrhage in the lungs.

Treatment.

Pigs and dogs must be given an emetic. The best and least dangerous emetic is sodium bicarbonate, of which two teaspoonsful must be dissolved in a cup of *lukewarm* water and administered. This treatment may be repeated up to three times, with fifteen minute intervals, if the animals fail to vomit. It will usually be found, however, that they vomit after the first dose. Further treatment of all affected animals must follow the instructions given in an article on poisonous plants. (Reprint No. 23, 1937.)

Prevention.—Syringa trees must not be planted near pig sties or in grazing paddocks. Pigs are very fond of eating the berries which have fallen from the trees, but cattle, sheep and goats usually avoid the berries unless driven by hunger.

Regional Improvement—

[*Continued from page* 21.

The dams are solidly constructed and have withstood some of the severest tests which they are apt to experience.

Montagu.

This district never had any big irrigation schemes and the farmers had to fend for themselves. The rainfall is so low that agricultural undertakings are dependent on irrigation. Private irrigation schemes existed long before the soil-erosion scheme was launched, but the generous terms of the Scheme were immediately taken advantage of and numerous dams have been built throughout the district.

Some of the dams are dependent upon a catchment area in the immediate neighbourhood, but the majority are filled from more or less permanent streams from the Wagenboom and Langeberge.

It is hardly possible to give an exact estimate as to the extent to which the district has benefited, but when the individual participants speak so favourably of the Scheme, the total agricultural production must have increased considerably as a direct result of the additional water.

The Grietje Family.

Its Importance in the Breeding of Frieslands in South Africa.

Dr. F. N. Bonsma, Department of Animal Husbandry, Agricultural Research Institute.

IN the breeding of Friesland cattle, the breeding value of the bull can be established far more readily than that of a cow. The greater number of progeny a bull is capable of producing with different females during any one season and at a comparatively early age makes it possible to determine his breeding value more accurately than that of a cow which is able to produce only one calf per year.

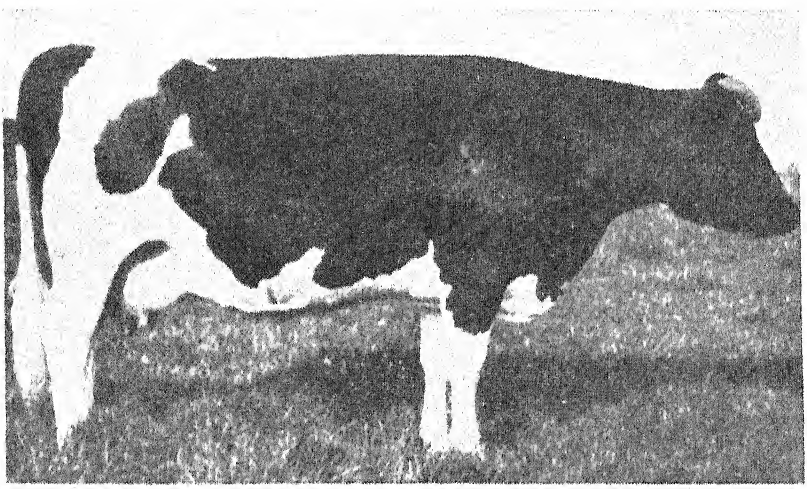
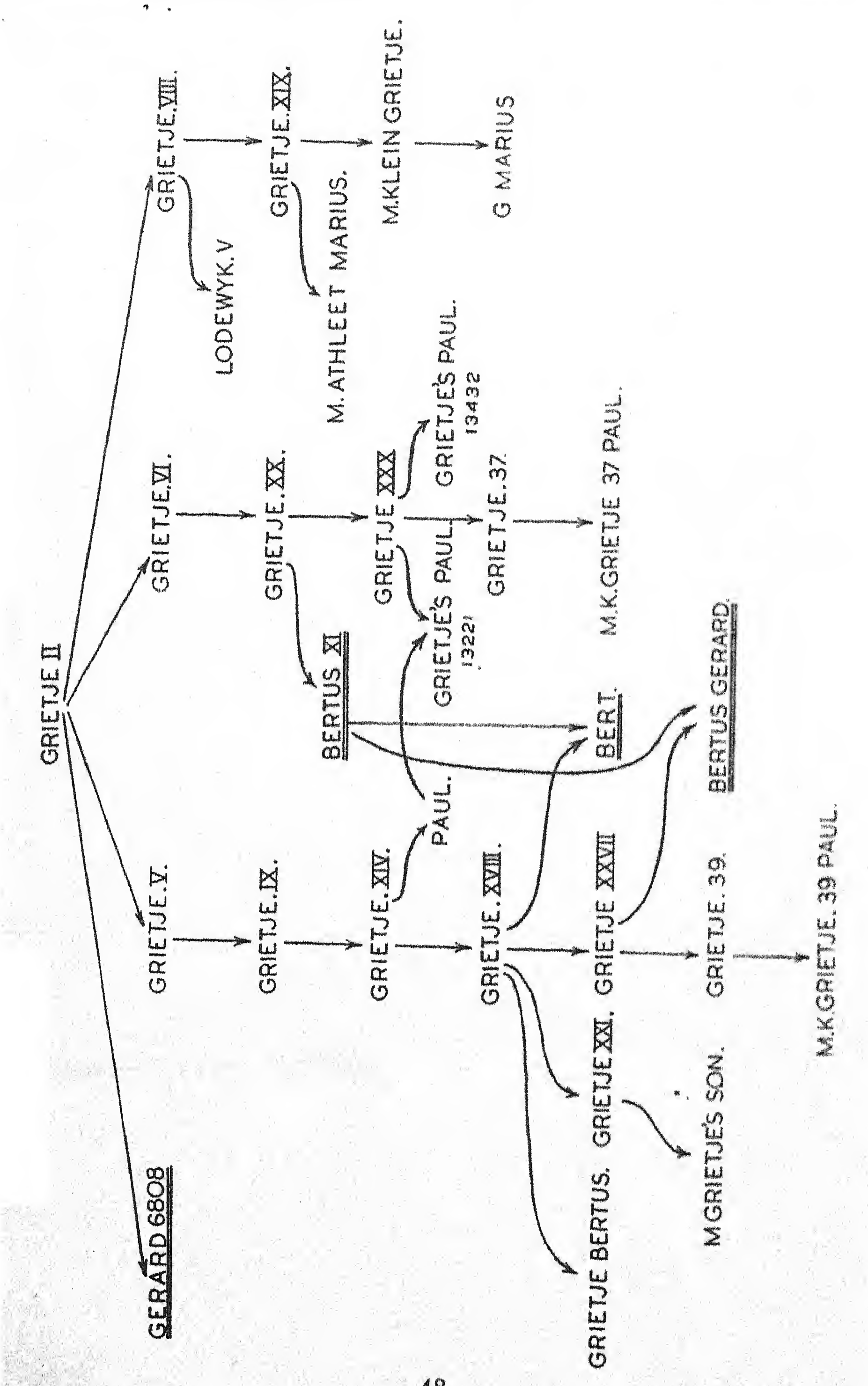


FIG. 1.—Grietje II 25975H. (82 points).

A Friesland bull which, on the merit of his progeny, has shown that he is a sire of outstanding excellence is declared preferent by the Friesland Breeders' Association. As a result of the greater numerical advantages of a male to improve a herd as compared with a female, breeders as a whole are inclined to attach more value to the male ancestors in examining a pedigree than to the female ancestors. It is rather remarkable in looking through the Friesland sale catalogues to find how few breeders take the trouble to publish the complete series of production records of the females appearing in the pedigrees of the bulls they offer for sale. The general policy seems to be to select one or two of the best lactation records of each cow


GRIETJE II
GERARD 6808
GRIETJE V.
GRIETJE IX.
GRIETJE XIV.
PAUL.
GRIETJE XVIII.
GRIETJE XXVII
GRIETJE 39.
M.K.GRIETJE 39 PAUL.
GRIETJE XXI.
M GRIETJE'S SON.
GRIETJE BERTUS.
BERT.
BERTUS GERARD.
GRIETJE VI.
GRIETJE XX.
BERTUS XI
GRIETJE XXX
GRIETJE'S PAUL. 13221
GRIETJE'S PAUL. 13432
GRIETJE.37
M.K.GRIETJE 37 PAUL.
GRIETJE VIII.
LODEWYK.V
GRIETJE XIX.
M. ATHLEET MARIUS.
M.KLEIN GRIETJE.
G MARIUS

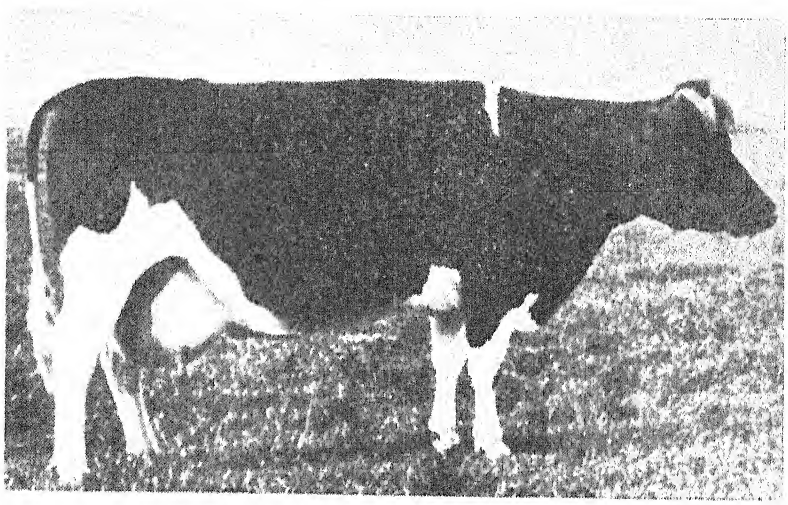


FIG. 3.—Grietje VI 39223 (81 points).

even in the case of cows with a series of completed records of all lactations. Lack of space and additional printing costs are usually given as an excuse for not giving all the records, but the additional costs may be considered negligible when compared with the possibility of obtaining better prices for their bulls. Complete records of all the females appearing in a pedigree must inspire confidence in buyers. The selection of only the more impressive records of individual cows, probably produced under forced conditions of feeding, does not inspire the initiated and experienced

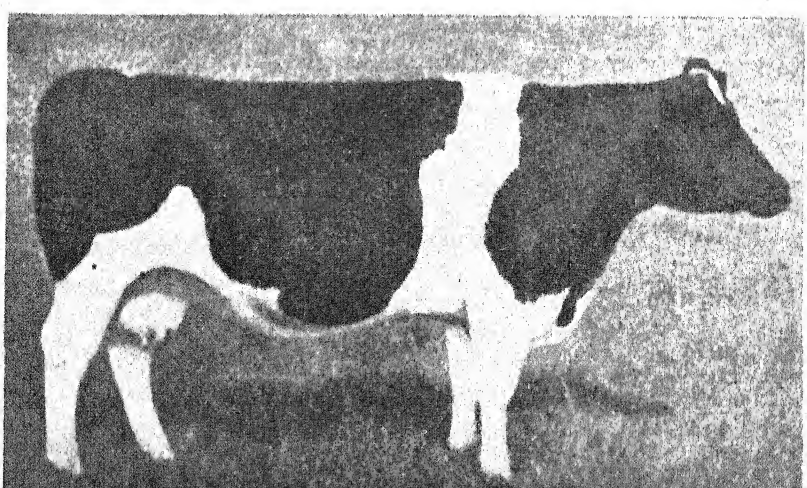


FIG. 4.—Grietje XVIII 63324 (83 points).

breeder with confidence, whereas the young and inexperienced breeder may be misled. The production of normal and regular official milk records for every lactation of all cows in a herd will lead to constructive improvement of individual herds and of the breed as a whole. The breeding and production value of a cow is, after all, determined primarily by the regularity of reproduction and her production ability throughout her life. From a practical point of view a single forced production record is of very little value as an indication of the breeding value of a cow.

Genetically there is ample proof to show that the hereditary contributions of the sire and dam to their progeny are equal. Both parents contribute the same number of hereditary factors to the genetic constitution of their offspring, although this may not seem so judging by the appearance and performance of the progeny as a result of the influence of dominant and recessive factors.

Although breeders generally appreciate the superior qualities and production of certain female families in their herds, the value and importance of the influence exerted by certain female lines on the improvement of the Friesland breed as a whole is often overlooked and not fully appreciated. The possibility of introducing a scheme of having outstanding females declared preferent on the basis of the appearance and production of their progeny should be considered in the near future. Even if it should only be possible to declare such cows preferent after their death, the information will be of very great assistance to breeders.

In order to indicate the value of a study of certain female lines, a brief analysis has been made of the important contribution made by the well-known Grietje family, bred by Mr. Jan Wassenaar of Jelsum in Friesland, to the breeding of Frieslands in Friesland and more particularly in South Africa.

Grietje II 25975 H must be considered the progenitor of the Grietje family. The following breeding and production record proves her remarkable reproduction and production value:—

TABLE I.

Year.	Milk production.	Percentage Butterfat.	Number of days.
1912	8,626	4·06	322
1913	9,016	3·88	278
1914	11,967	4·23	288
1915	12,024	3·98	325
1916	8,662	4·00	252
1917	10,115	3·87	264
1918	9,114	3·85	274
1919	9,954	3·89	327
1920	8,651	3·85	330
1922	10,063	3·81	286

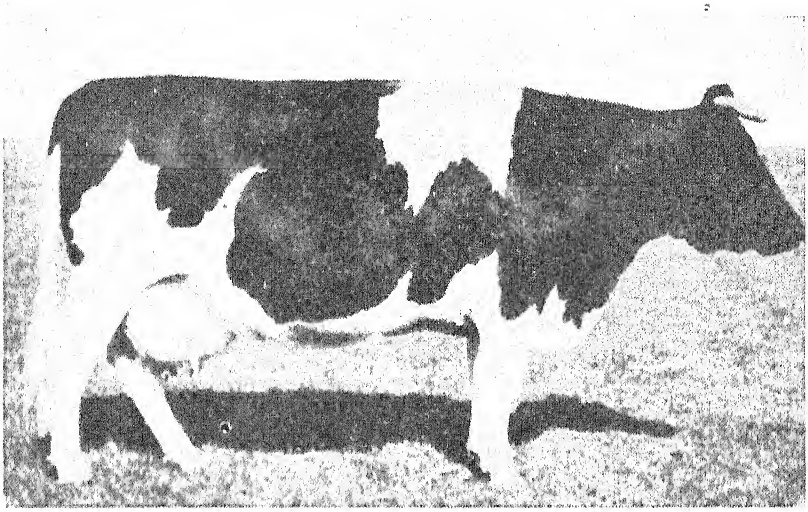


Fig. 5.—Grietje XX 72078 (89 points).

The remarkable regularity with which this cow bred, left little opportunity for forcing her to produce "artificial" records and her record should be an object lesson to all Friesland breeders. Most famous of Grietje II's progeny was her first bull calf born in 1912, the famous preferent sire Gerard 6808. Gerard left no less than 451 progeny registered in the F.R.S. Among the daughters of Grietje II: Grietje V, Grietje VI and Grietje VIII are of the greatest interest to Friesland breeders in South Africa. The female lines of Grietje V, VI and VIII are represented schematically in Figure 2.

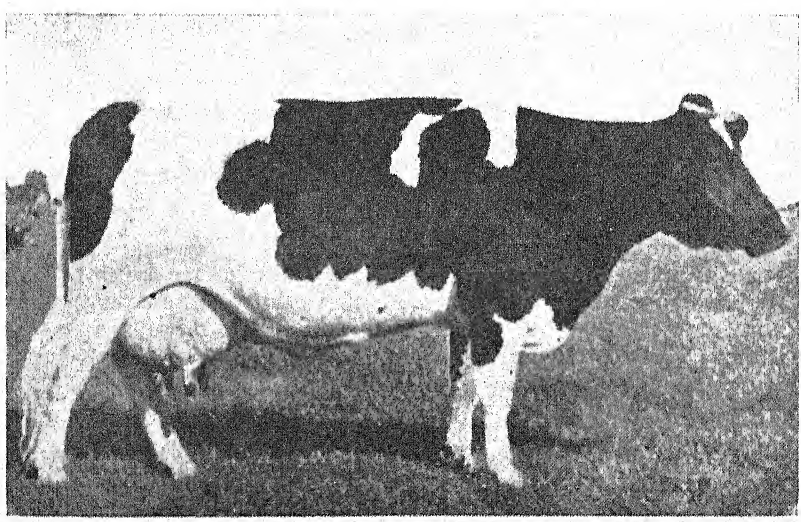


Fig. 6.—Grietje XXX 85203 (86 points).

Following the line of Grietje VI 39223 we find that mated to the preferent sire, Athleet 15272, she produced Grietje XX 72078 who scored 89 points and was the dam of the well-known preferent sire Bertus XI which was imported by Mr. Rautenbach of Kroonstad. Her daughter Grietje XXX 85203 (86 points) by Botermyn was the dam of Grietjes Paul 13221, imported by the University of Pretoria. This bull was responsible for a marked improvement in the herd of the Agricultural Research Institute, but unfortunately it died in December 1940. Grietje XXX's second carf Grietjes Paul 13432/10 by Lucies Paul 22212 was imported by Mr. Kingwell of Coloniesplaats and has proved a most successful sire. A daughter of Grietje XXX, namely Grietje XXXVII by Bert 21426 (also out of a Grietje cow) was imported by Mr. S. L. S. Cloete of Bedford and is the dam of M. K. Grietje 37's Paul recently sold to Messrs. Fraser Ltd. of Wepener.

Grietje V mated to Roland II gave Grietje IX; and the latter mated to Marius 11924 produced Grietje XIV 57973, the dam of Paul 20703, the sire of Grietjes Paul 13221 and Lucies Paul. Grietje XIV 57973 was also the dam of Grietje XVIII 63324. Grietje XVIII mated to Bertus XI produced the well-known preferent sire Bert 21426 imported by Messrs. van Niekerk Bros. of Brakfontein. Bert is still in use in the Brakfontein herd and is the sire of a number of herd sires used in various Friesland herds in South Africa, amongst which are Bert II 22978, imported by Mr. Rautenbach, Athleet Bert 13443, imported and used by Messrs. van Niekerk Bros., Reinos Bertus imported by Messrs Ross and Son. of Cavers and several Brakfontein-bred Bert sons. Grietje Bertus 13454 imported by Mr. L. Cloete was also out of Grietje XVIII. The daughter of Grietje XVIII, namely XXVII, was the dam of the preferent sire Bertus Gerard 12910 by Bertus XI imported by Messrs. Baynesfield Estate. A daughter of Grietje XXVII, Grietje XXXIX 19319 was also imported by Mr. S. L. S. Cloete and is the dam of M. K. Grietje 39 Jan Paul used at present in the herd of Mr. Pfaff. The late Mr. Warwick Evans imported Grietje XXI 11449, a daughter of Grietje XVIII. Out of Grietje XXI he bred Melrose Grietjes Son which was used in the herd of Mr. Jack Edwards. Lodewyk V 2734 a son of Grietje VIII by Lodewyk 13434, imported by Messrs. Ross and Son of Bedford, was the first bull to be imported out of a Grietje dam. This bull was used extensively in the Cavers herd.

A daughter of Grietje VIII, Grietje XIX, was also imported at the same time by Mr. Evans. Grietje XIX was the dam of Melrose Athleet Marius by Leewaarder Marius and was extensively used in the herd of Messrs. A. E. Murray and Son of Bloemhof. A daughter of Grietje XIX, Klein Grietje, was the dam of Glen Marius used at present in the Glen herd.

The fact that these various lines of the Grietje family are so well represented in some of the leading Friesland herds is indeed fortunate for South Africa. The production records of most of the Grietje dams of the bulls imported or bred in South Africa mentioned in this article are given in table 2. A study of these records leaves

little doubt as to the contribution which may be expected from the Grietje family to the improvement of the milk production and butterfat percentage of Frieslands in South Africa.

TABLE 2.

Name.	Milk Yield. lb.	Percentage Butterfat.	Days.	Age.
Grietje VIII 41353	12,806	4·11	327	5
Dam of Lodewyk V	10,428	4·06	247	6
	14,728	3·94	296	10
Grietje XVIII 63324	8,302	4·16	317	2
Dam of Bert 21426	12,298	4·13	329	5
Grietje Bertus 13454	15,628	4·15	391	6
Grietje XX 72078	8,585	4·62	320	2
Dam of Bertus XI	10,772	4·27	324	3
	17,557	4·80	376	5
	17,584	4·71	523	6
	16,318	4·92	417	8
Grietje XXX 85203	11,175	4·41	294	2
Dam of	10,571	4·45	307	3
Grietjes Paul 13221	13,629	4·54	318	4
Grietjes Paul 13432	13,523	4·39	312	5
Grietje XXVII 79413	10,109	3·71	328	2
Dam of	12,471	3·84	262	5
Bertus Gerard 12910	17,732	4·01	570	6
Grietje XIX 18080	13,373	3·78	300	3 Jnr.
Dam of	18,451	3·73	300	6
Melrose Athleet Marius	18,673	3·63	300	Mature.
Grietje XXXVII	9,811	3·98	300	3 Jnr.
Dam of M.K. Grietjes	13,173	3·61	300	4 Snr.
Grietje XXXIX 19319	9,251	3·89	300	2
Dam of M.K. Grietjes	9,435	3·84	270	3 Jnr.
Jan Paul	11,086	3·83	300	4 Jnr.
	8,274	3·92	254	Mature.

The Cultivation of the Soybean—

[*Continued from page* 16.

high as that of maize during normal times. There is reason to believe that the present yield per morgen will be appreciably increased as farmers achieve closer spacing and more thorough weed control and gain more experience with the crop. In the United States of America the average production per morgen was doubled over a period of 20 years' experience with the crop. In South Africa, production is still in the pioneer stage but it will presumably improve gradually so that the soybean will come to play an important rôle in our national economy.

East-coast Fever.

W. O. Neitz, Veterinary Research Officer, Onderstepoort, and
A. M. Diesel, Senior Veterinary Officer, Natal.

THE disease east-coast fever as well as the methods of control are well known to stock-owners associated with the east-coast fever areas of South Africa. Outbreaks have occurred from time to time in the Transvaal, Natal, the Transkei and the Eastern Cape. Although nothing new can be recommended for its eradication, it has been possible to eradicate the disease in a comparatively short time. co-operated closely with the Division of Veterinary Services, it has been responsible to eradicate the disease in a comparatively short time. An appeal is therefore made to such stock-owners to report all deaths as well as any illicit movement of cattle in areas where east-coast fever is suspected of being present.

In order to understand why certain methods of control are applied, it is necessary to give a short description of the disease as well as the life-history of the transmitters of east-coast fever.

The Cause of the Disease.

East-coast fever, which is also known as *Theileriasis*, is caused by a small micro-organism introduced by the bite of an infected tick. This micro-organism (*Theileria parva*) attacks first the white blood cells (*lymphocytes*) and subsequently the red blood corpuscles. The first symptom is noticed approximately 9 to 18 days after cattle have been infested with ticks, which harbour the infection. Affected animals show a febrile reaction. During the first four days of the disease only Koch's bodies, which represent the developmental stage of the parasite, in the white blood corpuscles (*lymphocytes*) are observed. After this peroid one finds the Koch's bodies as well as the fully developed parasites in the red blood corpuscles. These parasites may be so numerous that practically every red blood corpuscle may harbour one, two, three, four and frequently more organisms. During the first week of the reaction the animal may still feed well, but subsequently inappetence gradually takes place. Diarrhoea may later be observed. The lymphatic glands become swollen and there is a rapid loss of weight, with consequent depression, drooping ears, watering of the eyes and unsteady gait. The duration of the disease is 10 to 21 days. It is extremely seldom that an affected animal recovers. Up to the present no specific remedy is known.

The Diagnosis.

The diagnosis of east-coast fever is made by examining smears prepared from the blood, spleen and lymphatic glands. *It is essential that smears from all cattle that die or are killed should immediately be submitted for examination.* Smears must be made as soon as possible after death, as decomposition changes rapidly occur which

may render a definite diagnosis impossible, and thus considerably complicate control and eradication.

Smears should be prepared in the following way:—

(*a*) **Preparation of Glass Slides and Identification of Smears.**

Glass slides must be thoroughly washed and completely dried immediately before use, whereafter a gummed label of about $\frac{3}{4}''$ square should be affixed and on it written the following particulars:—

> Kind of animal, approximate age, date of death, owner, name of farm and type of smear, e.g., Cow, 4 years, died 15/4/41, J. Smith, Smithdene, Ixopo, Spleen.

The smear to be made will then be suitably identified and no confusion can result. The taking of the smear is then proceeded with.

(*b*) **Preparation of Smears.**

(i) *Blood smears.*—In very many of the protozoan diseases smears made during life from the first few drops of blood from a cut surface are preferable to smears made after profuse bleeding. In the dead animal, of course, this does not necessarily apply.

It must be appreciated that when blood smears are to be made from sick animals, blood will not readily flow if the skin is merely scratched. It is better to make a clean cut with a clean sharp knife or sharp pair of scissors, and the best way is to snip off a small piece of skin from the edge of the ear.

In the case of the dead animal that ear should be selected on which the carcass was found lying, as the blood will flow more readily from it.

A drop of blood should then be caught on the surface of the slide on which the smear is to be made, not in the middle of the surface, but towards the narrower edge. Using the edge of another clean slide this drop of blood is then to be filmed by one clean and straight movement and in a uniform manner over the whole surface of the glass slide on which the smear is to be prepared. This is done by placing the narrower edge of another clean glass slide on to the drop of blood and at an angle to the surface of the glass slide on which the smear is to be made. The drop of blood will then in a few seconds run along the edge of the glass slide which is to draw the film, and one clean movement with it across the surface of the glass slide on which the smear is to be made, will be all that is necessary. The cleaner the surface of the glass slide, the easier will be the operation. More than one movement will produce an unsatisfactory and broken film. This will also be the case if too much or too little pressure is exerted, or if the drop of blood is too big or too small.

The film should be just thick enough to be appreciated. It must not be too thin and it must not be too thick. It must not be wavy, and if any lines are seen in the film they should run parallel to the edge of the glass slide and not be wavy. A little practice will soon result in proficiency. This film must be allowed to dry in the shade and on no account placed against another slide until it is dry.

(ii) *Gland smears.*—In the sick animal the best gland to take material from is the one situated between the base of the neck and in front of the shoulder blade (prescapular gland). It is situated just below the skin and a little practice will soon allow the operator to grasp it firmly. A firm hold on it will be necessary or it will slip away under the skin.

A syringe needle about 1½″ long and having a fairly wide bore is boiled and allowed to cool. The gland is grasped tightly in one hand and the needle inserted right into the middle of the gland with the other hand. The needle must be pushed in from below and not from above. The needle is allowed to remain in the gland for a few seconds, during which time the gland is squeezed gently. On withdrawing the needle, gland fluid will be found in the bore of the needle and by gently blowing the syringe end of the needle this gland fluid can be transferred on to the surface of the glass slide on which the smear film is to be prepared. This film is then made in the same way as indicated for the preparation of blood smears.

In the case of the dead animal any large lymphatic gland may be selected. The gland is cut in two. Gland juice is then scraped on to the edge of a clean glass slide and transferred in the form of a film on to the glass slide on which it is to be prepared. Again the film must not be too thick or too thin, and must be made by one straightforward movement. The film must be allowed to dry in the shade before wrapping the slide for despatch.

(iii) *Smears from spleen, kidney, liver, etc.*—These, of course, will be made from the dead animal. Spleen smears can, however, be made from living animals by experts, without otherwise interfering with the health of the animal whose spleen is so punctured.

A piece of spleen, kidney or liver tissue is removed, preferably from the centre of the organ, and with the edge of a clean glass slide, sufficient is collected for transfer in the form of a film, on to the surface of the glass slide on which the smear is to be made. Again, this must be done in one straightforward movement and the resultant film must not be wavy. The lines which will show after the film has been made must run straight and parallel to the long edges of the glass slide.

Again the film must be just thick enough to be appreciated. On no account must an organ smear be made by drawing the surface of the glass slide over the cut surface of the organ. This invariably results in an imperfect smear.

(iv) *Tail smears.*—Should a carcass, when found, be badly decomposed. it is advisable to take a tail smear as well as spleen, blood and gland smears. The tail is severed about midway between the root and the tip and material taken from one of the exposed surfaces. The smear is then made in the same way as the other smears.

In all cases where smears are prepared, scrupulous cleanliness must be practised and every care taken to avoid contamination of the smear and smear material by dust, dirt, stomach and bowel contents, etc.

Furthermore, it must be appreciated that if too much material is filmed on to the glass slide, the drying out process will be slower and may result in decomposition of the material on the slide, thus rendering the smear unsuitable.

In the case of sick animals both blood and gland smears should be submitted and if the animal dies, a spleen smear as well.

(c) Dispatch of Smears.

Smears should be dispatched for examination as soon as possible after they have been prepared. Smears should be wrapped in such a manner that they will not break in the post.

In east-coast fever areas, all smears should preferably be posted to or handed to the inspector controlling the area. The smear should be accompanied by a short description of any symptoms observed while the animal was alive as well as any post-mortem observations.

If marked "Blood Slide" the smears may be dispatched O.H.M.S.

Wherever possible the carcasses of dead animals should be examined. The lesions of east-coast fever are characteristic. As a rule one finds that the lymphatic glands, the liver and spleen are swollen, the kidneys show large numbers of greyish-white foci or spots, the lungs are oedematous excess fluid, and the abomasum (4th stomach) shows a large number of erosions.

The Transmitters of East-Coast Fever.

It is of practical importance to know the various species of ticks that are capable of transmitting the disease. The vectors belong to the family *Rhipicephalidae*. Four species are known. Of these, *three species are three-host ticks* (brown tick, black-pitted tick, Cape brown tick), and *one species a two-host tick* (red tick).

In the life-cycle of the ticks several stages are recognised. The male and female tick copulate while they are attached to the host. After this act, the female engorges and detaches herself after 5 to 10 days. The male may remain attached for quite a time. The detached female looks for a suitable hiding place, and after a few days starts laying several thousand eggs, which hatch after 4 to 10 weeks. The larvae that emerge, creep up the grass and wait for an opportunity to attach themselves to a suitable host. The larvae engorge themselves in about 5 to 7 days, drop and moult to the nymphal stage after 14 to 30 days. The nymphae in their turn creep up the grass and also wait for an opportunity to attach themselves to a suitable host. The nymphae engorge themselves in about 5 to 7 days, drop off and moult to the adult stage after 20 to 40 days.

The life-cycle of the two-host tick, viz., the red tick, is slightly different. Here the larval and nymphal stages develop on the same host. The engorged larvae moult while they are attached to the host and then enter the nymphal stage. Detachment takes place only after the nymphae have engorged themselves. The nymphae moult to

the adult stage after about 20 to 40 days. The female adult ticks engorge in about 5 to 10 days, and after detaching themselves they start laying eggs.

The Way in which Ticks become Infected.

The stages that pick up the infection are the larval and nymphal, and the stages that transmit the disease are the ensuing nymphal and adult respectively. Infection of the larvae and nymphae takes place when these ticks are allowed to feed on reacting or infected animals. The ingested micro-organisms develop in the ticks and by the time that the ticks have moulted, the disease-producing organisms have also completed their life-cycle in the tick. When the infected ticks attach themselves to cattle they transmit the disease. It is of great importance to know that infected ticks cleanse themselves when they feed on a susceptible or an insusceptible animal. *The subsequent stage is incapable of transmitting east-coast fever.* The infection does not pass through the egg stage as is known to be the case with infections such as redwater and gallsickness.

It is of practical importance to know that unfed larvae may remain alive for six months, unfed nymphae for a period of nine months, and unfed adults for a period of twelve to fifteen months. It is therefore clear that the quarantine period can only be removed, at the earliest, fifteen months after the last case of east-coast fever on a farm.

The Way in which East-Coast Fever is Spread.

Ticks are the only vectors of east-coast fever. As a rule, this disease is spread when infected cattle which are infested with either the brown or the red ticks are moved on to clean farms. Other domestic animals or game play no rôle in disseminating this disease.

Infected ticks can also be introduced on to clean farms if hay and grass that is infested with these ticks is brought on to such a place, or if infected ticks are transferred on the hides of animals which have died from east-coast fever.

The Control of East-Coast Fever.

Every stock-owner should collaborate with the Division of Veterinary Services in order to eradicate the disease. The object is to prevent the spread and to eradicate the disease where it is known to occur, and to keep the incidence of brown and red ticks as low as possible.

On those farms where the owner has been practising regular dipping and hand-dressing, great losses will not occur. In areas where owners have not been eradicating the ticks, however, an outbreak of east-coast fever may result in extremely high losses before control or eradication is effected.

Where suitable tanks are available and cattle are properly dipped and hand-dressed, the main difficulty experienced is not, as a rule, due to escape of infected ticks from diseased animals, after the

adoption of the regular dipping, but to those ticks dropped from infected cattle before the efficient regular dipping and hand-dressing had been undertaken. This is proved by the fact that in so few infected areas are cases of east-coast fever met with after fifteen months from the commencement of regular dipping.

It is in the unknown infected area, where the disease has smouldered and the infection increased for some time before the adoption of effective measures, that the greatest difficulties of eradication have to be faced after the disease has been diagnosed. Moreover, movements of cattle from such areas set up fresh centres of infection over wide areas.

The importance of obtaining early evidence of the presence of infection must be fully realized; constant efforts should be made to ensure that every possible precaution is taken with a view to minimizing the danger that exists in this respect. It is necessary to take precautions against the possible release of infected areas from quarantine before they have become clean, as a case of east-coast fever may so easily escape detection that it is not safe to grant such release unless there is reliable evidence to show that the full quarantine period has expired since the last death from the disease. This is no easy matter in infected areas carrying large numbers of stock; indeed, in the absence of exact counting of the cattle on every dipping day, and of a satisfactory system of obtaining suitable smears for microscopical examination from dead animals, it is not possible to conclude with certainty that an area has become clean.

While adequate official supervision is supplied to enforce these necessary precautions, it must be recognized that the stock-owner is in the best position to secure his property against infection and loss, and those who consistently dip and hand-dress their cattle every week (or at the required interval) will not lose heavily should the disease appear.

Precautionary Measures.

The main precautionary measures necessary for the prevention and eradication of east-coast fever may be summarised as follows:—

(1) Early diagnosis; properly prepared blood and lymph-gland smears from sick, and blood, lymph-gland and spleen smears from dead cattle should be immediately forwarded for examination.

(2) Efficient dipping and hand-dressing.

(3) Suitable tanks, kraals, and crush-pens must be maintained in good order.

(4) Fencing—internal as well as external.

(5) The isolation of sick cattle and the immediate destruction of those infected with east-coast fever.

(6) Control of all cattle including the tenants' stock on the farm.

(7) Correct census of cattle, with births, deaths, removals and introductions recorded daily.

(8) Control of all movement of stock in the district.

Isariopsis Leaf-spot in Vines.

Dr. S. J. du Plessis, Department of Plant Pathology, Stellenbosch-Elsenburg College of Agriculture of the University of Stellenbosch, in collaboration with the Fruit Research Institute.

ISARIOPSIS leaf-spot in vines is a disease which was unknown in South Africa until recently when it made its first appearance in a Stein-grape vineyard in the Bottelary area, Stellenbosch, during the 1939-1940 season. During this season the leaves of the vines were

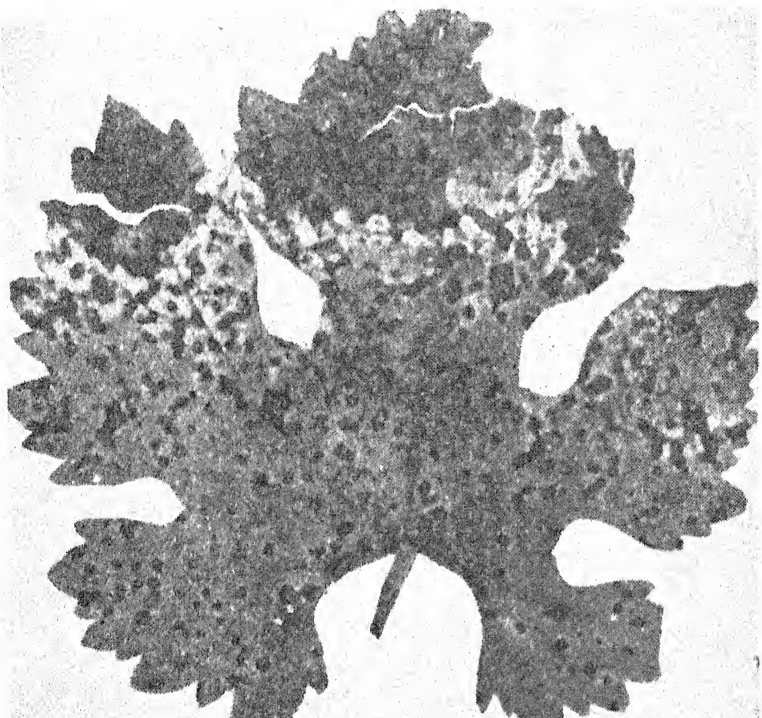


FIG. 1.—A Stein-grape vine leaf infected with *Isariopsis* leaf-spot disease.

affected to such an extent that a considerable percentage prematurely yellowed and dropped.

The disease was also noticed in a vineyard in Wellington, but other vineyards which have since been visited, still appear to be unaffected.

Symptoms of the Disease.

Fortunately this disease affects only the leaves and not the shoots or the bunches. Nevertheless, serious infection and the cosequent

heavy loss of prematurely dropping leaves may inevitably lead to a gradual weakening of infected vines. Apparently the disease makes its appearance only when the warmer summer weather sets in, i.e., from about the middle of November. Thereafter it gradually spreads, especially after rain, until the vegetative growth of the vine has more or less ceased. The number of leaf spots then increase rapidly, especially after the crop has been gathered. In the vineyard mentioned above, the disease spread so rapidly that practically all the leaves were heavily infected a month after the crop had been picked.

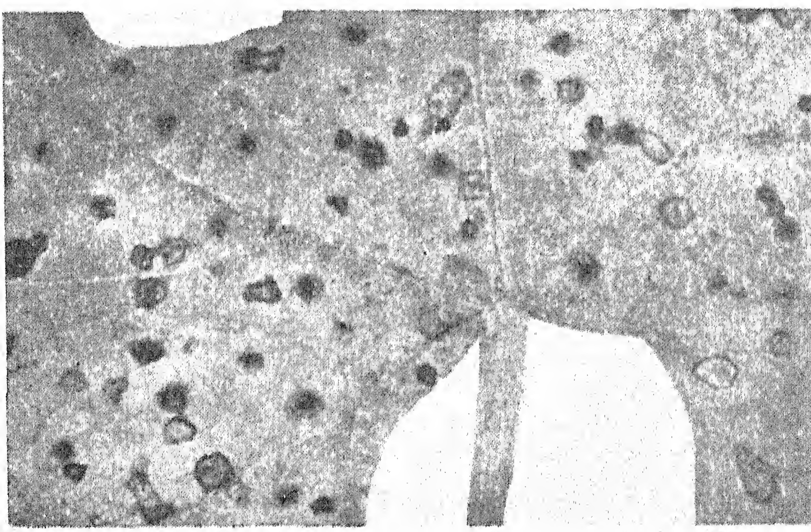


FIG. 2.—Part of an infected leaf magnified to show the nature of the spots.

New spots are at first indistinct, blackish-brown in colour and more or less circular. Subsequently their circular form becomes more regular. On the upper surface of the leaf they are sharply outlined by a slightly raised, narrow dark brown margin or ring, and the enclosed area is of a light greyish brown colour. (Figs. 1 and 2.)

On the underside of the leaf the fully developed spots are dark brown in colour, and the brown edge is less distinct. The central parts of the spots are darkly speckled.

When the spots appear on the leaves in large numbers, they may merge, causing a gradual yellowing and subsequent browning of the leaves. This discolouration starts at the tips and leads to a drying up of the leaves which are then easily torn by the wind.

Of all the grape varieties in the infected vineyard, the leaves of the Stein grape were found to be the most susceptible to infection, whereas those of Cabernet, Hanepoot, Canaan and Green grape or Wyndruif, proved to be less susceptible.

The Casual Fungus.

The causal fungus [*Isariopsis Fuchelii* (Thum) du P.] forms its reproductive spores in the central dotted area of the leaf spots, and preferably on the underside of the leaf. These reproductive spores are borne on broomshaped bundles or mycelia which grow from the leaf tissues and sometimes occur in large numbers in an erect position on the leaf surface. (Figs. 3 and 4.) These broomshaped bundles are highly resistant and are clearly discernible during early spring

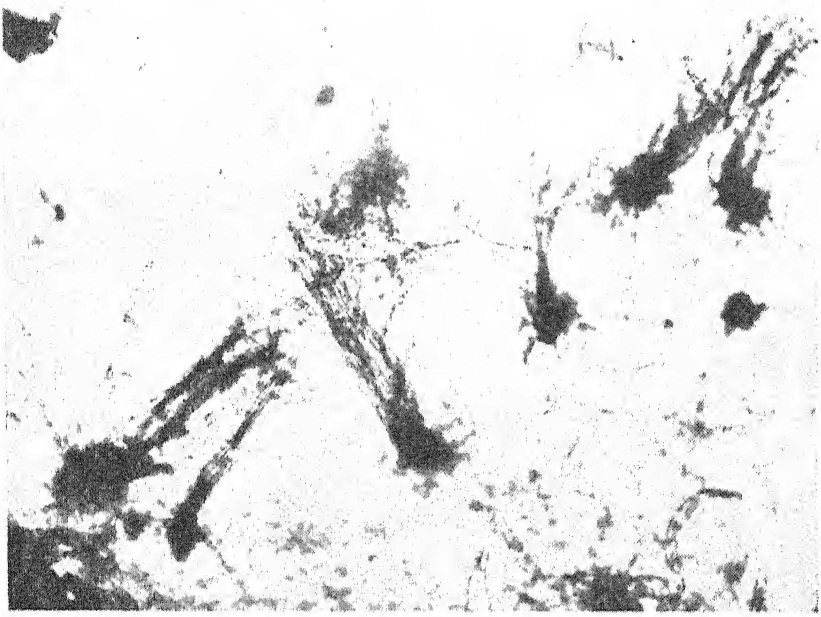


FIG. 3.—Broom-shaped conidiophore bundles on the leaf surface under low magnification.

on old rotting leaves left lying in the infected vineyard. During moist spring weather these mycelia on old rotting leaves may start growing again and may even produce a fresh crop of reproductive spores on their tips. Such infected leaves therefore serve as a source of infection from which the disease may spread during spring.

It has been found that the fungus enters the leaves mainly by way of the stomata, and that comparatively hot weather and the presence of moisture favour infection. It has also appeared that the comparatively heavy dew which is experienced during the period following the removal of the crop, is sufficient to enable the disease to spread very rapidly. Apparently rain is not essential for infection at this stage.

Control Measures.

From data obtained from spraying tests carried out in the infected vineyard, it appears that thorough spraying in winter with lime-sulphur (1 to 8) (Figs. 5 A and B), copper sulphate (1 lb. to

2 gallons of water) or zink sulphate (1 lb. to 2 gallons of water) resulted in only a slight decrease in the number of infected leaves or leaf-spots. It is significant to note that data in connection with *Oidium*, which were obtained simultaneously from the experimental plots, are similar to the above. These facts indicate that the organism of this disease overwinters mainly on infected material in the vicinity of the vine, and not on the vine itself.

When the experimental vineyard was inspected a week after the crop had been picked (20.1.1941), it was clear that three summer

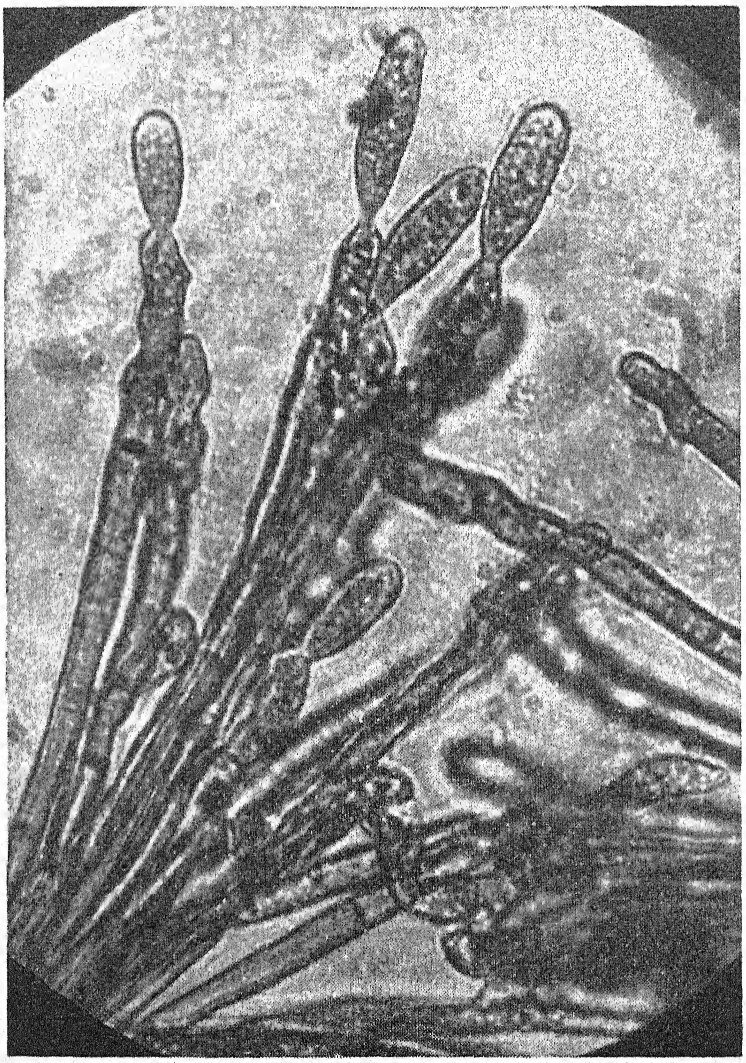


FIG. 4.—Young spores at the tips of the conidiophores under high magnification.

applications of Bordeaux mixture (4:4:50) (Fig. 5 D), verderame dust, copper-sulphur mixture and sulphur dust (Fig. 5 C) all proved very effective in bringing about an appreciable reduction in the number of leaf spots. Of all the treated vines, those dusted with sulphur showed the smallest number of spots. After a month, however, vines sprayed with Bordeaux mixture were clearly showing the best results. Other treated vines were somewhat poorer, but still much better than those which had been treated in winter or those which had received no treatment, for at this stage the latter were almost entirely without leaves, whereas those treated in summer still had their full foliage. Since the last summer spray was applied on

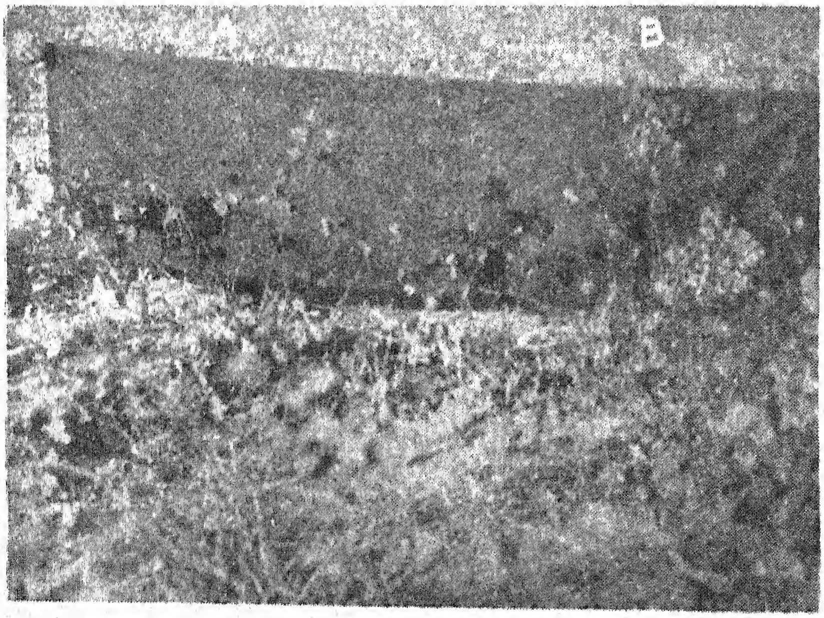


FIG. 5.—A: An untreated Stein-grape vine with hardly any leaves at the end of February as a result of *Isariopsis* infection.
B: A Stein-grape vine at the end of February. This vine was sprayed during the previous winter with lime-sulphur (1 in 8).

9.12.1940 and the Bordeaux mixture adhered to the leaves more effectively than the fungicides applied in powder form, it is clear that a further application is essential immediately after the crop has been picked, especially in cases of dust treatments.

As regards the respective merits of the above-mentioned fungicides, sulphur deserves preference. Since sulphur is commonly used in most vineyards for the control of *Oidium*, the use of this fungicide for the control of *Isariopsis* leaf-spot would involve practically no additional cost. Furthermore sulphur is, generally speaking, about 50 per cent. cheaper than any of the copper-containing fungicides.

Once again it must be stressed that farmers should carry out

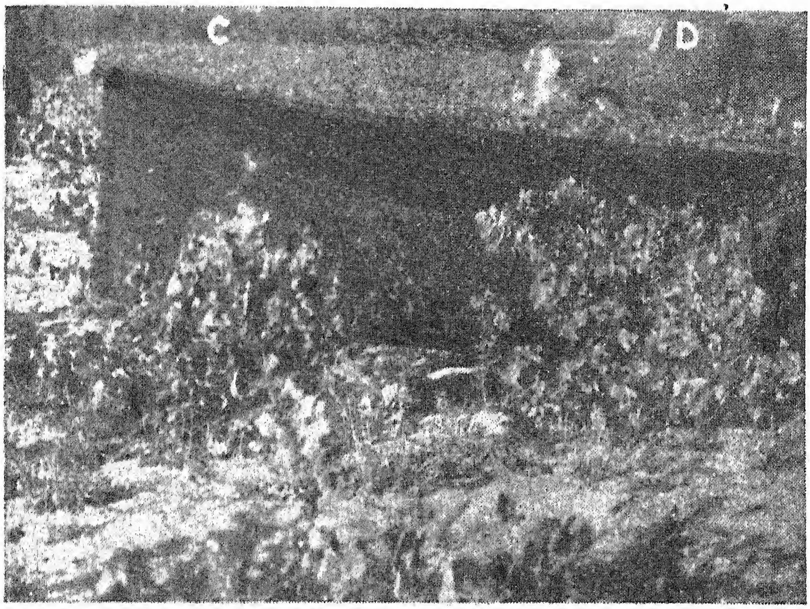


FIG. 6.—C: A Stein-grape vine at the end of February. This vine was treated with sulphur three times during the summer.
D: A Stein-grape vine at the end of February. This vine was sprayed three times with Bordeaux mixture (4:4:50) during summer.

these treatments much more thoroughly than is usually the case in actual practice. Clear proof that this warning is necessary was obtained simultaneously with these experiments in a case where the owner of the experimental vineyard obtained much poorer results, in the control of leaf-spot as well as *Oidium*, with four sulphur applications on the surrounding vines than the writer with three treatments.

The following are the most effective measures for the control of *Isariopsis* leaf-spot:—

1. Removal and destruction of all leaves in infected vineyards or ploughing under of such leaves during early winter to such a depth that they will not readily be brought to the surface again during subsequent cultivation in the spring.

2. Thorough application in summer of either Bordeaux mixture (4:4:50), Verderame dust, copper-sulphur dust or, particularly, sulphur, at the following times:—

(*a*) When the shoots are approximately ten inches long, i.e. about the second week in October for the majority of the relatively early vineyards.
(*b*) When the vines have flowered, i.e. about the second week in November for vineyards as in (*a*).
(*c*) Approximately four weeks after the second application, or about the second week in December.
(*d*) Immediately after the grapes have been picked.

The Farm Home.

(A Section devoted mainly to the interests of Farm Women.)

Bush Tea.

Miss B. Taute, Home Economics Officer, Stellenbosch.

IN the Cape Province there are many kinds of bush tea. Most of the varieties used fairly extensively belong to the Genus *Cyclopia*. Rudolf Marloth tells us there are 12 known species, confined to the western mountains, the most common being *Cyclopia genistiodes*. It is " a compact shrub, 2 to 3 feet high, with virgate branches ending in large trusses of sweet-scented, bright-yellow flowers visited by carpenter bees ". The shrublet most frequently used as tea is *Cyclopia vogelii* from the Swellendam mountains, also called honey or boer tea. In the Cape Peninsula the narrow-leaved *Cyclopia genistiodes* is used, and along the coast *Cyclopia tenuifolia* or vlei tea, *Cyclopia subternata* is used at George and Caledon and *Cyclopia latifolia* in the Zwartberg. Lidjes tee, *Thesium spicatum* is found in the Cedar mountains in small quantities. It is black when ready for use. Rooibos, Naald- or Koopmanstee—*Borbonia pinifolia* grows in the Cedar mountains and along the Olifants River. The twigs and leaves are cut up and fermented like the Cyclopia.

Marloth explains that " several species are used by the colonists, as they yield an article known as ' bush tea '. The young twigs are gathered when in flower and submitted to a process of fermentation or sweating by piling them up in a heap. They are then dried in the sun, and if this is done with care and expedition, the tea possesses a sweet aroma. The ordinary article of commerce, however, often consists of old branches and not rarely contains woody sticks, lumps of soil and leaves of other plants ". There is also a considerable difference between the products of various districts.

Method of Preparation.

The differences in the flavour of tea from different districts is caused not only by the use of different shrubs, but also by different methods of preparation.

In the George district, the small twigs and flowers are picked early in the morning and put into grain bags. Tea is always sweated on " baking days ", while the bread is baking in the huge Dutch oven, the tea is shaken out of the bags and cut up finely by means of a chaff cutter. It is then put back into grain bags, immersed in cold water and drained well. As soon as the loaves are taken out of the oven, the tea is put in and left overnight.

Next morning the mahogany brown tea is spread out on to a tarpaulin to dry. A large quantity of tea should be stirred occasionally and might take two or three days to dry; a small quantity would dry in a day. The tea is then spread out on a loft to dry still further and put into bags as soon as it is quite dry.

Nowadays there are several "tea plantations" in the western Cape Province. The tea is actually planted and picking is done more carefully than in the past. Modern improvements are the use of tea cutters, careful bruising of the leaves, controlled temperature during the sweating process and sorting. The tea produced under these conditions is much better than that made in the past. A wider use should be made of bush tea. It is cheaper than other kinds of tea and contains much less tannin. At present it is often recommended by medical practitioners for this reason.

Low Tannin Content.

The leaves contain Cyclopin and Cyclopic acid. Cyclopin is a glucoside, and Cyclopia red, a compound similar to cinchonanova red, is formed from it. This substance gives the tea its characteristic colour as tannin is practically absent. Samples of several brands of tea sold in large quantities in the Union at present, contain an average of 12 per cent. tannin. The average for "bush tea" was found to be 5·74 per cent., while "needle tea" obtained from several places contained an average of 3·72 per cent. tannin. The commercial tea contained 3·6 per cent. caffein, and the "bush" and "needle" teas only traces of it.

The "bush tea" samples were "brewed" for an hour before the tannin was extracted to see if more tannin was extracted because of the longer brewing. The fact that more milk is used when pouring a cup of bush tea should not be lost sight of, as the little tannin present is thus still further diluted, and combines with the milk proteins to a certain extent.

When a tea infusion is added to a gelatine solution, the tannin precipitates the gelatine. It is to this reaction of tannin with gelatine and other proteins that the injurious effects of excessive teadrinking are ascribed. The tannin is said to act upon the protein in the cells lining the digestive tract.

The essential oils and caffein in tea are readily extracted after about five minutes' infusion, but the tannin is not so readily extracted. The tannin content of bush tea is so low that even the long infusion does not cause it to become concentrated. The tannin in China tea is less readily extracted than that in most Indian tea, but the "bush teas" definitely have the lowest tannin content of any tea procurable.

Method of Brewing Bush Tea.

Place half a cup of tea leaves in a warm clean teapot kept specially for making bush tea. Pour a little hot water over it and drain off in order to remove dust which may be clinging to the leaves. Pour three cups of boiling water on the tea and leave for half an hour to an hour. Fill cups two-thirds with boiling milk and fill up with the strong tea. Serve hot.

A second lot of water may be poured on to the tea leaves and used as there is no danger of tannin being extracted as in the case of ordinary tea. However, fresh leaves should, be used after the second brewing.

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1. Applied Chemistry: Tinkler and Masters.
2. The Flora of South Africa: Rudolf Marloth.
3. The Common Names of Plants: Rudolf Marloth.

Three Months' Course in Sheep and Wool Classing.

FOR the duration of the war and a year thereafter the wool farmer of South Africa is assured of a fixed price for his wool, but since the price is fixed on a grade basis, it is absolutely essential that it must be well classed and prepared for the market.

Never before has correct classing of the clip paid the farmer so well, and this opportunity of getting every penny possible should not be missed.

To enable the farmer to obtain a thorough knowlege of wool classing, the Glen College of Agriculture is again holding its annual Course in Sheep and Wool Classiing commencing on 3 February next and ending on 1 May, 1942.

Owing to the popularity of this course and the limited accommodation, it has been found necessary to restrict the attendance. Those interested should therefore be requested to send in their applications without delay to the Principal, College of Agriculture, Glen.

Crops and Markets

A Statistical and Economic Review of South African Agriculture

by

The Division of Economics and Markets

Volume 20 JANUARY, 1942 No. 233

CONTENTS

Time Rings Changes.

As announced in the previous issue of *Crops and Markets* this paper will from now on be published under one cover with *Farming in South Africa*, although retaining its own identity.

Except for the present issue, less space will have to be devoted to statistical tables than has been the case in the past, in view of the necessity of economising on paper and printing. Readers who are interested in following changes in the prices of farm products and farming requisites would, therefore, be well advised to keep past issues handy for two or three months for reference purposes. Although it will be possible to publish some prices in tabular form only once every quarter, a review will be given in each intervening issue of monthly changes of such prices. (Where these changes are of importance.)

For those readers of *Farming in South Africa* who are not acquainted with *Crops and Markets* it may be stated that this paper is in the first place a statistical journal which summarizes every month, or as often as practicable, statistical and other information relating to the production, prices and export of articles of importance to the agricultural industry of the Union of South Africa. Since the outbreak of hostilities it has naturally been impolitic to publish export figures. It aims further at interpreting the reasons for the changes in the published statistics and to give a brief review of the outstanding occurrences of economic significance to South African agriculture, including new measures of agricultural economic policy.

The Drought of 1941.

PRACTICALLY the whole of the coastal belt from about Port Elizabeth to Zululand experienced severe drought already during the autumn of 1941. Conditions were especially bad between Port Elizabeth and East London where the summer-rainfall of 1940-41 was considerably below normal. Most of the south-eastern corner of the Union, as far inland as Wodehouse and Maclear was in the grips of a severe drought by the middle of the winter. Drought-stricken conditions gradually extended further inland. By the beginning of September the distdicts of the southern O.F.S. were seriously affected and by October virtually the whole of Griqualand-west and the Bechuanaland districts were drought-stricken. About the middle of November parts of the north-western O.F.S. and the western Transvaal were also facing a critical position. Also in the north-eastern section of Natal drought effects became serious in some districts from about September.

In all these areas rainfall has been considerably below normal since the latter part of the last summer. The winter was very dry. Fair rains fell in some parts during October, but were followed by dry hot winds which, coupled with the absence of rain in November, created conditions which were very serious for most stock farmers, resulting in the loss of large numbers of both cattle and sheep.

The south-eastern section of the Union (including the eastern-Cape Province, the Transkei and the southern O.F.S.) which apparently suffered most, had 38 districts declared drought-stricken by the middle of October. Rains during the latter half of October and beginning November improved matters to such an extent in some parts in this area that 9 districts could be removed from the list of districts declared drought-stricken. But on account of the dry-hot weather and absence of rain during the larger portion of November, conditions so retrogressed that other distiets soon had to be added to the list; thus by the end of November the number again stood at 36 in this section of the country.

In the area spreading fan-wise from Kimberley northward (including the Bechanaland districts, the western Transvaal and the north-western O.F.S.) grazing had become such a serious problem during the spring that 13 districts were declared drought-stricken in this area during October and November.

Although the drought of 1941 has been very widespread, affecting practically the whole of the summer rainfall area of the Union, and although some severe losses were suffered in the belt stretching from the south-eastern coastal bulge of the Union, north-east to the Molopo river, it has from a livestock point of view not been as serious in the major stock areas, as the major droughts of 1933, 1937 or even that of 1938. So, for instance, it may be noted that in all 61 districts were declared drought-stricken during the whole of 1941 as compared with 93 in 1933, 102 in 1937, 96 in 1938 and 52 for the 15 year average 1926 to 1939.

Although the effect of the 1941 drought has on the whole not been as severe as that of previous major droughts on the sheep and

cattle industry of the country, it has had most far reaching effects on the production of crops in practically the whole of the summer rainfall area. Low precipitation during the winter and spring seriously affected the production of vegetables everywhere and the wheat crop in the eastern Cape and the eastern O.F.S. With the moderate rains in October, farmers on the Transvaal Highveld and in the northern O.F.S. were able to plough and to plant fair acreages of mealies, but with the absence of further rain during practically the whole of November, germination was poor in many cases and in others the young plants could not stand the drought, so that most of the planting for the coming crop had to be done after the rains which began on the Transvaal Highveld about the 27th November and gradually extended to the western Transvaal and the northern O.F.S.

As is well-known, November is a critical month for the production of mealies in the major producing areas and it is, therefore, of interest to note that the average rainfall in these areas during November 1941 has been by far the lowest on record since mealies have become an important commercial crop, that is since 1915. The *average* rainfall during last November in the three main mealie producing areas of the Transvaal high veld, the northern O.F.S. and the western Transvaal has been less than a ¾ inch, which compares with the previous low record average of 1¼ inch for November in each of the unfavourable years 1927, 1935 and 1937. The supply of white mealies, which requires a longer growing season than yellow mealies, will be most affected by the late plantings. S. J. de S.

Review of Prices for November, 1941.*

Prices of slaughter stock on the Johannesburg and Durban markets rose further during November, excepting compounds on the former market which declined from 44s. 11d. per 100 lb. estimated dressed weight *on the hoof* in October to 42s. 8d. in November and to 38s. 3d. in the beginning of December. Ordinary primes on this market, however, advanced from 53s. 6d. in October to 63s. 2d. in November and to 66s. 2d. in the beginning of December, and good mediums from 50s. 1d. to 55s. 3d. and 58s. 6d. for these respective periods.

On the Durban market mediums rose from 46s. 1d. in October to 51s. 4d. in November per 100 lb. dressed weight *on the hook* and compounds from 34s. 8d. to 36s. 4d. During the first week in December, however, prices of these classes declined sharply, mediums falling to 43s. 2d. and compounds to 26s. 1d. This decline in prices of the poorer classes of cattle to a more normal level was due to the arrival on the market of larger supplies, resulting from better grazing conditions in certain stock areas notably in the eastern Cape Province, and also from the fact that the weight limitations on the import of cattle from adjoining territories to the quarentine markets of the Union was temporarily suspended. This measure was taken in order to ease the serious position which had

* All prices are averages. For full particulars the price tables printed elsewhere in this issue should be consulted.

arisen on the market as a result of the drought and the increased demand.

Prices of slaughter sheep in general showed little or no change during November compared with the previous month, but remained relatively stable at a high level.

Prices of porkers and baconers increased on the Johannesburg market in November, prime porkers from 5d. per lb. live weight in October to 5·5d. and prime baconers from 5·6d. to 6·2d.

Maize.—The maximum wholesale prices fixed resulted in the free-on-rail producers' prices remaining more stable. The average November price of grade 2, white maize, in bags f.o.r. was 10s. 10d. and that of grade 6, yellow maize, for the same month, 9s. 9d. per bag. *Kaffercorn* rose from 18s. 1d. per bag in October for K1 to 18s. 11d. in November and K2 from 18s. 1d. to 19s. 6d. The drought and poor prospects of the next season's crop contributed to a large extent towards this increase in prices.

Lucerne and teff hay.—Exceptionally large supplies of which a high percentage comprised decolourized and inferior quantities, as well as large consignments of Transvaal oat hay arrived on the Johannesburg market in November and caused prices of these products to decline, although good qualities continued to realize high prices. Cape lucerne per 100 lb. on the Johannesburg market declined from 5s. 8d. in October to 4s. 5d. in November, Transvaal lucerne from 5s. 6d. to 3s. 11d. and teff hay from 3s. 10d. to 3s. 6d. Towards the end of November and the beginning of December, larger supplies of better quality hay arrived on the market and the average prices of lucerne and teff hay were very much higher for the week ending 5th December e.g. Cape lucerne 5s. 5d., Transvaal lucerne 5s. 1d. and teff hay 4s. 9d.

Vegetables.—In spite of fairly large quantities of nearly all kinds on all markets, the supply was inadequate for the strong demand. Green peas were relatively scarce and obtained higher prices everywhere than during the previous month. Exceptionally large consignments of tomatoes from the Transvaal of which a large proportion was very green, caused values to decline during the beginning of the month. Later in the month, however, supplies were more limited and prices improved considerably.

Potatoes and onions.—Larger supplies resulted in prices, especially in the case of onions, being generally lower than during the previous month. The price of Transvaal onions on the Johannesburg market during November was 9s. 1d. per bag as against 11s. 3d. in October and that of Cape onions on the Cape Town market 10s. 1d. as against 12s. 11d. On the latter market the largest decline in potato prices was also reflected, these falling from 33s. 5d. per bag for Cape No. 1 during October, to 26s. 10d. in November, especially on account of large supplies, which had been dug out too early, arriving on the market and the necessity for selling them immediately. For the small supply of National Mark potatoes on the Johannesburg market the demand, however, was good and prices of these advanced compared with those in October. The measure by which maximum prices of potatoes were fixed, under certain

conditions, at 25s. per bag and which came into effect towards the end of November, contributed towards the decline in average prices in the beginning of December, e.g. on the Johannesburg market Tvl. No. 1 and No. 2 realized 20s. and 18s. 6d. per bag respectively, and National Mark Grade 1, No. 2 and 3, 23s. 1d. and 22s. 0d. per bag respectively. The contribution of price fixation towards the decline in prices is accounted for by the fact that the maximum price at which potatoes can be sold *wholesale* is 25s. per bag i.e. the trader buying on the market cannot sell the better quality potatoes to the retailer at more than 25s. per bag and as he must allow for his costs and a profit, he must of course take this into account when buying. As the maximum selling price to the retailer is 25s. per bag, that of lower grades will be proportionately lower.

Fruit.—Short supplies of oranges and paw-paws caused an exceptional rise in prices on all markets e.g. Valencias on the Johannesburg market from 1s. 11d. per pocket in October to 2s. 8d. in November; on the Cape Town market from 1s. 9d. to 2s. 7d. and on the Durban market from 1s. 8d. to 2s. 5d.

Eggs.—Moderate supplies and a strong demand caused prices on all markets to improve slightly during November.

Index of prices of field crops and animal products.—As shown elsewhere in this issue, the combined index of the above groups advanced a further 2 points in November as compared with October, viz. from 120 to 122.

The winter cereals group, shows the largest increase of the month viz. from 119 points in October to 133 in November. The higher subsidy on wheat, which producers receive from November for the 1941-42 crop, was mainly the reason for this. Slaughter stock also increased with a further 5 points from 135 to 140, and the group, poultry and poultry products, with 3 points from 115 to 118.

The hay group shows an appreciable decline from 138 points to 110 in November, while the index for "other field crops", i.e. for potatoes, sweet potatoes, onions and dried beans declined from 268 to 250 points. The remaining groups all remained more or less constant.

Third Estimate of Expected Wheat Crop, 1941-42 Season.

ACCORDING to conditions prevailing towards the end of November, based on reports received from crop correspondents, the Division of Economics and Markets estimates, that a wheat crop of 4,420,000 bags (of 200 lb.) may be expected this season as compared with that of 4,350,000 bags, made in October. The crop expectations have improved in the Cape Province as a result of favourable weather conditions obtaining during November, whilst it deteriorated in the Orange Free State and the Transvaal owing to the strenuous drought which prevailed.

The November estimate for the various areas is as follows in bags (the corresponding figures as estimated in October are shown

in brackets): Cape Province 2,930,000 (2,680,000); Orange Free State, 930,000 (1,060,000); Transvaal, 560,000 (610,000); Union, 4,420,000 (4,350,000).

Prices of Maize and Maize Products.

IN order to confine the price of maize and maize products to the the consumer within certain limits, maximum prices at which these products may be sold, have now been fixed. For grades 2 and 6 (per 200 lbs.) in bags for transactions in Transvaal and Orange Free State prices are as follows:—

	s.	d.
Not less than 500 bags	12	11
Less than 500 but not less than 220 bags	13	2
Less than 220 but not less than 110 bags	13	5
Less than 110 but not less than 50 bags	13	8
Less than 50 but not less than 20 bags	13	11
Less than 20 but not less than 6 bags	14	2
Less than 6 but not less than 1 bag	14	5

For maize in elevators the maximum price is 1s. 1d. per bag less. For transactions in the Cape Province and Natal 4d. per bag should be added to these prices. Maximum prices for other grades of maize as well as for maize meal and other maize products have been arranged accordingly. These prices include railage to the railway station or halt nearest to the buyer. These maximum prices do not apply to seed maize bought in quantities not exceeding 10 bags at a time.

Full particulars regarding these measures have been published in the Govenment Gazette Extraordinary of the 21st November, 1941.

Prices of Dairy Products.

AS notified in the *Government Gazette Extraordinary* of 28 November 1941, the wholesale and retail prices of all grades of cheese and of first grade butter have been increased by 1d. per lb. Maximum retail prices of these products are now as follows:—

	1st Grade.	*2nd Grade.*	*3rd Grade.*
Creamery Butter	1s. 9d.	1s. 7d.	1s. 5d.
Cheese	1s. 5d.	1s. 4d.	1s. 2d.

These increases in prices enabled the Board also to fix the prices to producers of cheese milk and butterfat deliverd to factories during the summer months as from 1st Decembed, 1941, on a level higher than that of the previous season *viz.*

Cheese milk at 7½d. per gallon or 1s. 9d. per pound of butterfat when purchased on that basis, while for the previous summer *viz* from November, 1940 to March, 1941, the price was 6d. per gallon or 1s. 5d. per pound butterfat respectively.

Butterfat at 1s. 4d., 1s. 2d. and 1s. per pound for 1st, 2nd and 3rd grade respectively, while for the period January to June, 1941, it was 1s. 2d., 1s. 1d. and 11d. per pound respectively. These increased

prices to producers became necessary in consequence of the increased cost of production of butterfat and cheese milk found in the course of a recent investigation by the Division of Economics and Markets.

Control of Agricultural Prices.

By Price Controller.—The following fixations have direct bearing on agriculture:—

1. The maximum price for wet-salted hides of a minimum weight of 45 lbs. when cured and not intended for export has been fixed as follows as from October 17, 1941: pitsalted 4½d. per lb.; stack-salted hand flayed 4¾d. per lb. and stack-salted "perco" flayed 5d. per lb.
2. As from the 1st November 1941, the maximum price at which potatoes may be sold by any person, who is not a licensed dealer in such goods to a licensed dealer in such goods may not exceed 25s. per bag of 150 lbs.
3. The fixed price for apricots for canning or processing is £16 13s. 4d. per ton f.o.r. seller's station.
4. Fertilizer and bonemeal prices may not exceed those at which these articles were sold in September 1941, for similar kinds quantities and conditions of delivery and payment.

An increase in the prices mentioned will henceforth be subject to the approval of the Controller of Prices.

By Conttrol Board.—The following fixations have been made by the relative Control Boards with due regard to production costs:—

Wheat prices fixed for the present season varies according to class and grade from 26s. 9d. to 14s. per bag. Included in these prices is a Government subsidy varying from 5s. 3d. to 2s. 6d. per bag.

Maize.—The maximum prices fixed for consumers must necessarily have a stabibizing effect on the prices to producers. The prices fixed appear elsewhere in this issue.

Butterfat prices have been fixed at 1s. 4d., 1s. 2d., and 1s. per lb. for 1st, 2nd and 3rd grade respectively as from 1st December, 1941. These prices include no subsidies.

Cheese-milk prices have been fixed at 7½d. per gallon or 1s. 9d. per lb. butterfat if sold on this basis, as from 1st December, 1941.

Tobacco prices fixed for the present season by the Board for the various types, grades and areas are 15 per cent. higher for flue-cured, 22½ per cent. higher for light sun cured and 7½ per cent. higher for dark sun-cured Virginian tobacco than the prices fixed in respect of the 1939-40 season.

Chicory prices for this season are 29s., 27s. and 24s. per 100 lbs. f.o.r. producers' station for 1st, 2nd and 3rd grade respectively and are increased by 2d. per 100 lbs. per month as from the 1st November, 1941.

Wool prices fixed for the various types are based on the average of 10¾d. per lb. grease wool by arrangement between the British and Union Governments. A.R.H.

Table 1.—Average Prices of Slaughter Cattle and Pigs.

SEASON (1st June to 31st May).	BEEF PER 100 LB.						PIGS PER LB. LIVE WEIGHT.		
	(a) Johannesburg.				(b) Durban.		Johannesburg.		
	N.M. Prime.	Ordinary. Prime.	Good Medium.	Com-pounds.	Medium.	Com-pound.	Porkers, Prime.	Baconers, Prime.	Stores.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	d.	d.	d.
1938–39..........	41 9	39 0	36 3	31 7	33 0	27 4	5·3	6·2	4·9
1940–41..........	43 11	41 4	37 11	32 5	31 1	25 4	4·5	5·4	4·0
1940—									
November.....	48 1	45 4	42 0	36 6	34 5	27 6	4·7	5·7	4·3
December......	46 8	44 7	40 2	35 3	31 7	25 9	4·5	5·6	3·9
1941—									
January.......	45 7	42 11	39 6	34 7	32 2	27 7	4·8	5·7	4·0
February......	45 0	41 2	38 1	32 9	29 11	24 5	4·3	6·2	4·1
March........	40 6	38 3	35 5	29 7	27 11	21 4	4·2	6·1	3·6
April..........	42 4	39 10	36 3	30 1	29 10	25 5	4·2	5·6	3·8
May...........	44 6	40 8	36 10	30 9	29 4	22 1	4·2	5·6	3·9
June..........	43 9	41 2	37 6	32 8	32 2	25 9	4·3	5·4	3·7
July...........	46 5	44 5	39 10	33 5	34 6	29 11	4·6	5·6	4·0
August........	47 0	44 9	41 2	33 7	35 5	29 3	4·5	5·6	3·5
September.....	49 11	47 1	44 2	36 11	41 9	33 11	4·8	5·6	3·7
October........	56 5	53 6	50 1	44 11	46 1	34 8	5·0	5·6	4·2
November.....	68 4	63 2	55 5	42 8	51 4	36 4	5·5	6·2	4·8

(a) Estimated dressed weight of cattle as sold on the hoof.
(b) Dressed weight of carcase sold on the hook.

Table 2.—Average Prices of Sheep per lb. Estimated Dressed Weight.*

SEASON (1st June to 31st May).	JOHANNESBURG.				CAPE TOWN.			
	Merino Wethers.		Persians and Cross Breds.		Merinos.		Capes and Persians.	
	Prime.	Medium.	Prime.	Medium.	Prime.	Medium.	Prime.	Medium.
	d.	d.	d.	d.	d.	d.	d.	d.
1938–39..........	6·3	5·5	5·8	5·1	5·8	5·6	5·9	5·7
1940–41..........	6·7	6·1	6·2	5·7	6·1	5·8	6·3	6·0
1940—								
November......	6·9	6·2	6·1	5·5	5·8	5·5	6·3	6·1
December.......	7·0	6·5	6·5	6·1	6·1	5·9	6·4	6·1
1941—								
January........	7·0	6·5	6·5	6·0	6·3	6·1	6·4	6·1
February.......	7·1	6·6	6·7	6·2	6·9	6·5	6·8	6·5
March..........	6·7	6·1	6·2	5·7	6·3	5·9	6·2	5·9
April...........	7·0	6·5	6·4	5·9	6·6	6·1	6·4	6·1
May............	7·1	6·5	6·6	6·0	6·0	5·8	6·3	6·0
June...........	7·1	6·6	6·6	6·1	6·3	5·9	6·5	6·2
July............	7·7	7·0	7·2	6·6	7·0	6·7	6·9	6·6
August.........	7·6	7·0	7·1	6·5	7·1	6·7	6·8	6·6
September......	8·2	7·6	7·7	7·0	7·2	6·8	7·2	6·9
October.........	7·4	6·7	7·0	6·3	6·6	6·4	6·8	6·6
November......	7·4	6·8	6·9	6·3	6·8	6·5	6·9	6·6

* As sold on the hoof.

Table 3.—Average Prices of Maize, Kaffir-corn and Dry Beans per 200 lb.

SEASON AND MONTH.	MAIZE.					KAFFIRCORN F.o.r. Producers Stations.		DRY BEANS Johannesburg (Municipal Market).	
	F.o.r. Producers' Stations.				Cape Town Consumers' Price F.o.r. No. 6 in Bags.				
	No. 2.		No. 6.						
	Bags.	Ex Elevator.	Bags.	Ex Elevator.		Bags, K. 1.	Bags, K. 2.	Speckled Sugar.	Cow Peas.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
1938–39.........	8 7	8 6	8 6	8 8	13 2	13 1	12 9	25 0	16 9
1940–41.........	9 2	8 8	9 3	8 9	14 0	15 6	17 0	30 0	16 8
1940—									
November.....	8 10	8 3	8 11	8 5	13 6	—	16 11	35 1	16 0
December......	9 8	8 9	9 9	8 11	14 0	23 6	21 11	35 10	13 10
1941—									
January.......	9 9	8 11	9 9	9 0	14 1	24 3	23 0	35 3	14 11
February......	9 10	9 2	9 10	9 3	14 8	—	23 3	37 0	17 6
March.........	11 2	10 4	11 1	10 5	14 11	—	22 6	34 9	18 10
April..........	10 3	9 8	10 8	10 0	14 11	14 3	15 8	33 2	18 6
May...........	9 1	—	9 4	—	14 4	14 5	14 8	31 0	19 0
June..........	9 2	—	9 0	—	13 8	15 3	15 9	32 6	19 5
July...........	9 3	—	9 1	—	13 7	17 4	17 10	34 8	21 9
August........	9 5	—	8 9	—	13 8	16 9	17 3	35 0	20 8
September.....	10 2	9 3	9 4	8 7	13 9	17 9	18 9	35 6	18 6
October........	10 10	9 11	9 10	8 10	13 11	17 3	18 1	34 6	20 10
November.....	10 10	9 10	9 9	8 10	13 10	18 11	19 6	35 2	19 5

Seasonal year for maize and kaffircorn, 1st June–31st May; for dry beans, 1st April–31st March.

Table 4.—Average Prices of Lucerne and Teff Hay and Certain Meals for Feeding.

SEASON (1st July–30st June).	LUCERNE (100 lb.).			TEFF Johannesburg. (a) (100 lb.).	MEALS FOR FEEDING: F.o.r. Johannesburg.				
	Johannesburg (a).		Cape Town, Cape 1st Grade.		Lucerne. (100 lb.).	Monkey Nut Cake (200 lb.).	Oats, Sussex Ground (150 lb.).	Bone, 24·8% Protein (100 lb.).	Mixed, 26·4% Protein (100 lb.). (b)
	Cape	Transvaal							
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
1938–39.........	3 11	3 1	4 0	2 7	6 9	15 2	15 4	8 5	8 0
1940–41.........	4 2	3 5	4 3	3 3	6 7	15 3	14 8	11 2	8 7
1940—									
November.....	4 3	3 10	3 10	4 7	6 6	15 6	15 0	11 0	8 6
December	4 1	3 8	3 11	4 8	6 6	15 6	15 0	11 0	8 6
1941—									
January.......	3 9	3 2	4 0	3 0	6 6	15 0	14 6	11 0	8 6
February......	3 9	2 8	4 1	2 8	6 6	14 6	14 0	11 0	8 6
March.........	3 6	3 0	4 5	2 7	6 6	14 0	14 0	11 0	8 6
April..........	4 0	3 11	5 0	2 10	6 6	14 6	14 0	11 0	8 6
May...........	5 3	3 10	5 0	2 10	6 9	14 6	14 6	11 0	8 6
June..........	5 3	4 9	5 5	3 1	7 0	15 6	15 0	11 0	9 6
July...........	5 2	5 2	5 10	3 10	7 6	15 6	16 0	11 0	9 6
August........	5 6	6 3	5 11	3 3	8 0	—	17 0	11 0	9 6
September.....	6 5	6 1	5 7	3 9	8 6	16 0	17 6	11 0	9 6
October........	5 8	5 6	5 1	3 10	8 6	—	17 6	11 0	9 6
November.....	4 5	3 11	4 11	3 6	8 6	—	—	11 0	9 6

(a) Municipal Market. (b) Approximately half of the protein is claimed to be animal protein.

Table 5.—Average Prices of Potatoes and Onions on Municipal Markets.

SEASON (1st July to 30th June).	POTATOES (150 lb.).						ONIONS (120 lb.).		
	Johannesburg.				Cape Town.	Durban.	Johannesburg.	Johannesburg.	Cape Town.
	Transvaal. No. 1.	Transvaal No. 2.	N.M. Grade 1. No. 2.	N.M. Grade 1. No. 3.	Cape No. 1.	Natal No. 1.	Transvaal.	Cape.	Cape
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
1938-39.........	6 9	6 2	8 10	8 1	8 3	8 10	8 3	8 10	7 4
1940-41.........	14 2	13 4	18 6	18 5	15 7	16 10	12 5	12 3	9 10
1940—									
November.....	15 11	14 5	18 8	17 10	16 11	19 2	11 4	14 2	9 10
December......	15 8	13 5	16 11	16 2	10 10	19 5	9 5	10 1	5 8
1941—									
January.......	11 4	10 1	12 4	11 7	10 2	14 4	7 3	7 3	4 7
February......	8 9	8 2	12 1	11 9	14 2	11 0	6 9	7 4	4 10
March.........	10 10	10 7	13 9	13 8	13 0	13 5	8 1	8 10	5 4
April..........	14 8	14 10	19 9	19 0	19 4	17 11	8 11	9 9	7 8
May...........	15 3	14 4	21 1	20 11	16 9	17 11	9 9	10 3	7 6
June..........	17 9	17 10	22 10	22 7	18 2	21 4	10 8	13 2	9 5
July...........	22 9	23 5	28 0	28 5	26 8	27 6	16 1	16 1	12 11
August........	18 10	19 10	26 10	27 2	24 8	24 9	13 0	19 0	15 8
September.....	19 2	20 1	25 1	24 8	28 0	26 7	17 1	16 9	13 9
October........	26 0	24 10	28 8	28 8	33 5	29 8	11 3	17 1	12 11
November.....	25 0	24 3	34 1	32 11	26 10	29 8	9 1	—	10 1

Table 6.—Average Prices of Green Beans, Green Peas and Carrots on Municipal Markets.

SEASON (1st July to 30th June).	GREEN BEANS (Pocket 20 lb.).			GREEN PEAS (Pocket 20 lb.).			CARROTS (Bag). (a)		
	Johannesburg.	Cape Town.	Durban.	Johannesburg.	Cape Town.	Durban.	Johannesburg.	Cape Town.	Durban.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
1938-39.........	1 8	2 3	2 0	2 4	1 9	1 2	3 8	2 6	6 1
1940-41.........	1 11	2 9	1 5	2 8	2 4	2 3	5 9	4 11	13 4
1940—									
November.....	1 11	0 10	1 1	2 4	1 6	2 5	3 7	2 6	2 10
December......	1 6	0 9	2 0	2 4	1 2	2 5	3 11	1 9	2 11
1941—									
January.......	1 5	—	1 3	2 11	2 8	2 9	4 8	2 1	5 5
February......	1 9	1 9	1 7	2 9	—	2 6	7 11	3 0	15 1
March.........	1 6	1 8	1 5	3 7	4 8	2 9	9 2	3 2	13 7
April..........	1 10	2 5	0 9	2 9	2 8	2 9	8 7	3 8	19 5
May...........	1 5	2 4	1 5	3 4	3 2	1 10	6 7	5 8	13 9
June..........	3 0	3 5	2 11	4 6	3 6	2 2	6 4	9 0	13 3
July...........	6 4	6 0	6 11	6 6	3 9	5 1	8 5	9 9	10 11
August........	3 0	3 7	3 10	3 6	3 0	3 8	10 4	11 6	16 8
September.....	2 9	4 6	3 1	3 4	3 3	2 1	8 10	9 0	12 2
October........	2 0	3 9	1 9	2 5	2 0	3 6	6 4	7 1	12 10
November.....	2 1	3 5	1 5	4 0	2 6	4 3	7 6	7 10	8 8

(a) Weights of bags vary, but on the average are approximately as follows:—Johannesburg, 130 lb.; Cape Town, 90 lb.; and Durban, 120 lb.

Table 7.—Average Prices of Cabbages, Cauliflower and Tomatoes on Municipal Markets.

Season (1st July to 30th June).	Cabbages (bag). (a)			Cauliflower (bag). (a)			Tomatoes (Trays 15 lb.)			
							Johannesburg.			
	Johannesburg.	Cape Town.	Durban.	Johannesburg.	Cape Town.	Durban.	N.M. No. 1.	Other.	Cape Town.	Durban.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
1938–39	3 10	3 0	3 10	3 0	1 8	3 5	2 2	1 3	1 8	0 10
1940–41	5 10	4 8	7 1	3 11	4 3	5 3	2 7	1 6	2 1	1 2
1940—										
November	2 9	2 0	3 3	—	2 1	3 5	2 3	1 3	2 6	0 10
December	3 10	1 4	3 6	2 7	1 9	1 0	3 2	1 4	1 11	0 9
1941—										
January	5 7	1 5	4 11	3 10	1 6	—	3 4	1 7	0 11	1 4
February	7 4	3 5	11 9	5 6	4 2	9 6	2 7	1 4	1 5	1 2
March	7 4	4 11	10 10	4 10	4 1	5 5	3 5	1 8	2 2	1 4
April	6 0	5 3	6 10	3 11	3 5	5 1	2 11	1 6	2 5	1 7
May	5 3	4 10	5 5	4 2	4 8	4 9	2 5	1 5	1 10	1 4
June	6 2	5 5	8 2	5 6	4 3	6 10	2 7	1 8	2 6	0 11
July	10 3	5 11	8 0	6 7	6 0	6 8	2 10	1 7	2 4	1 1
August	8 5	4 7	4 8	4 4	4 11	5 5	3 5	2 4	1 11	0 9
September	10 0	6 6	3 8	5 6	6 9	6 7	2 9	1 9	2 2	0 10
October	10 3	7 11	4 2	8 4	6 2	—	2 0	1 1	1 9	0 6
November	11 3	8 1	4 8	—	6 2	—	3 3	1 11	2 10	1 7

(a) Weights of bags vary, but on the average are approximately as follows: For cabbages: Johannesburg, 105 lb., Cape Town 105 lb., and Durban 90 lb. For cauliflower: Johannesburg 100 lb., Cape Town 65 lb., and Durban 85 lb.

Table 8.—Average Prices of Apples, Pears and Grapes on Municipal Markets.

Season (1st July to 30th June).	Apples (Bushel box).						Pears (Bushel box).		Grapes (Tray).
	Johannesburg.			Cape Town.			Johannesburg.		Johannesburg.
	O'henimuri.	White Winter Pearmain.	Wemmershoek.	O'henimuri.	White Winter Pearmain.	Wemmershoek.	N.M. No. 1.	Other.	Johannesburg.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
1938–39	7 2	6 0	5 10	7 3	8 0	4 3	6 7	4 2	1 3
1940–41	8 4	7 1	6 4	8 11	10 8	5 7	8 11	6 3	1 8
1940—									
November	11 6	6 9	—	11 7	14 8	—	—	—	—
December	11 8	—	—	—	—	—	—	—	2 5
1941—									
January	—	—	—	8 5	—	—	7 0	5 8	1 7
February	—	—	—	7 11	10 6	4 5	9 0	6 9	1 6
March	6 8	5 11	5 7	6 9	7 3	5 2	9 0	6 2	1 10
April	6 9	6 4	6 1	7 6	7 11	5 7	6 3	6 5	1 11
May	7 5	6 3	6 10	8 3	7 10	5 9	8 1	5 11	2 0
June	8 3	7 8	8 4	9 11	9 10	6 9	—	9 5	1 2
July	8 2	7 2	8 5	11 3	11 4	12 6	10 7	7 5	—
August	8 4	8 1	7 3	11 0	11 0	11 8	—	11 1	—
September	11 8	9 1	8 3	10 9	12 10	—	—	—	—
October	10 8	9 0	6 10	10 6	13 5	—	—	—	—
November	16 0	13 0	—	8 5	13 8	—	—	—	—

Table 9.—Average Prices of Oranges and Pawpaws on Municipal Markets.

SEASON (1st April to 31st March).	ORANGES (Pocket).							PAWPAWS (Standard box).	
	Johannesburg.			Cape Town.		Durban.		Johannesburg.	
	N.M. Navels.	Other.							
		Navels.	Valencias.	Navels.	Valencias.	Navels.	Valencias.	N.M.	Other.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
1938–39.........	1 10	1 6	1 5	2 0	2 1	—	—	2 0	1 7
1940–41.........	1 9	1 7	1 6	1 11	1 10	2 4	2 1	2 2	1 9
1940—									
November.....	—	1 9	1 6	3 3	1 11	3 1	—	2 4	1 11
December......	—	—	1 9	—	1 9	—	—	2 7	1 9
1941—									
January.......	—	0 11	1 9	—	1 10	—	2 11	2 6	1 6
February......	—	2 2	2 2	—	2 9	—	—	3 7	2 10
March.........	—	2 3	2 10	3 0	2 9	2 9	—	3 5	2 7
April..........	1 9	1 8	1 5	2 5	1 11	2 1	—	2 7	2 1
May...........	1 9	1 5	1 4	1 7	1 0	2 2	—	2 0	1 6
June..........	1 8	1 6	1 3	1 7	—	1 8	—	1 6	1 4
July...........	1 8	1 7	1 3	1 8	—	1 11	1 6	1 5	1 2
August........	2 2	2 2	1 7	1 11	1 6	1 10	1 8	1 11	1 8
September.....	2 4	2 1	1 9	2 4	1 8	2 6	1 8	1 9	1 5
October........	—	1 10	1 11	3 2	1 9	3 5	1 8	2 3	1 10
November.....	—	2 9	2 8	3 1	2 7	—	2 5	3 2	2 6

Table 10.—Index of Prices of Field Crops and Animal Products.

(Basic period 1936-37 to 1938-39 = 100.)

SEASON (1st July to 30th June).	Summer Cereals, (*a*)	Winter Cereals. (*b*)	Hay. (*c*)	Other Field Crops. (*d*)	Pastoral Products. (*e*)	Dairy Products. (*f*)	Slaughter Stock. (*g*)	Poultry and Poultry Products. (*h*)	Combined Index.
WEIGHTS.	19	13	2	3	34	6	17	6	100
1936–37.........	118	86	93	92	120	86	89	98	106
1937–38.........	98	106	111	117	97	113	106	108	100
1938–39.........	92	107	95	88	79	103	106	94	93
1939–40.........	85	106	76	92	114	105	106	87	103
1940–41.........	104	113	105	159	101	108	110	110	107
1940—									
January.......	97	108	66	87	120	103	103	82	106
February......	94	109	74	75	128	103	104	83	108
March.........	99	109	73	85	132	103	105	92	112
April..........	99	109	81	100	139	103	100	115	115
May...........	104	108	86	104	133	106	103	123	116
June..........	98	109	92	112	114	110	99	104	106
July...........	96	109	97	132	102	116	101	100	103
August........	97	109	109	149	102	116	103	80	103
September.....	101	109	113	216	102	116	109	80	107
October........	102	108	99	225	99	114	117	83	108
November.....	106	115	112	168	100	107	117	88	108
December......	116	115	109	147	101	107	116	100	110
1941—									
January.......	116	115	98	121	100	104	115	96	108
February......	117	115	92	115	100	104	112	107	108
March.........	130	115	87	125	100	104	105	125	111
April..........	121	116	98	167	101	106	108	151	113
May...........	108	116	125	160	101	109	108	157	112
June..........	107	116	126	183	101	111	111	150	112
July...........	108	118	128	241	100	130	118	145	116
August........	107	118	132	216	100	130	119	169	113
September.....	115	118	154	228	100	130	128	108	117
October........	120	119	138	268	100	128	135	115	120
November.....	121	133	110	250	100	128	140	118	112

(*a*) Maize and kaffercorn.
(*b*) Wheat, oats and rye.
(*c*) Lucerne and teff hay.
(*d*) Potatoes, sweet potatoes, onions and dried beans.
(*e*) Wool, mohair, hides and skins
(*f*) Butterfat, cheese milk and condensing milk.
(*g*) Cattle, sheep and pigs.
(*h*) Fowls, turkeys and eggs.

CONTENTS.

◆ ◆ ◆

HORSE IMPROVEMENT

Stallions will stand at stud at the following Government Institutions during the breeding season, 1941-1942:—

1. College of Agriculture, Middelburg, Cape: Percheron.
2. College of Agriculture, Potchefstroom, Tvl.: Percheron, Thoroughbred and Donkey Jack.
3. College of Agriculture, Glen, O.F.S.: Percheron, Thoroughbred and Donkey Jack.
4. College of Agriculture, Cedara, Natal: Percheron.
5. Stellenbosch-Elsenburg College of Agriculture of the University of Stellenbosch, Stellenbosch, C.P.: Percheron.
6. Veterinary Research Station, Ermelo: Percheron and Thoroughbred.

All service fees are £1. 1s. per service.

Maintenance and grazing fees are 2s. 6d. per week, but an additional fee of 1s. per day is charged when supplementary feeding is found necessary or when such feeding is especially requested by mare owners.

As a veterinary examination is necessary before mares are sent for service, farmers who desire to make use of the facility, should act at once, as only a limited number of mares can be accommodated at one time at institutions.

The South African Railways allow a rebate on all mares sent for service.

Further particulars of the horse improvement scheme are obtainable on application to the institution to which it is desired to send mares for service.

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D. J. SEYMORE, Editor

FARMING IN SOUTH ... AFRICA

Vol. 17 FEBRUARY, 1942 No. 191

Editorial:

Live-Stock Remedies.

DURING the past few years, great progress has been made with research work on various chemical substances suitable for the treatment of disease in human beings and animals. Many of us have already heard of the preparation M. and B. 693, with the aid of which excellent results have been obtained in the treatment of certain forms of pneumonia in human beings, and of Uleron which has been used with marked success in certain stages of heartwater. Since the discovery of the Sulphonamide group by Domagh in 1935, these chemical substances, which now form a large group, have been very extensively investigated and tested in an attempt to discover a preparation superior to M. and B. 693 or Uleron. It is difficult to give an indication in this article of the gigantic scale on which this work is being conducted in hundreds of institutes all over the world. This is work which requires the most diligent research, and tests have to be made not only to determine the value of the remedies in combating the causes of diseases, but especially to prove that the substances will have no harmful effect on human beings or animals treated with them.

In spite of the good results obtained, reports are constantly coming in of cases where large-scale applications of the remedies, made under certain conditions, resulted in failure or caused harmful results or even poisoning. Some of these remedies seem to affect certain susceptible individuals in a most harmful and detrimental manner.

Much useful knowledge has been gained, but even to-day we do not know precisely in what way germs exercise their harmful effect on the human and animal body, nor how the various remedies react when administered. In this respect treatment, even with these important remedies, is still largely empirical.

In spite of the fact that remedies have been discovered which react fairly specifically in certain organisms or worms, it is essential that research work should be continued even more intensively in an attempt to discover substances which would react more effectively and with less harmful results in certain circumstances.

Notwithstanding the fact that Atebrin and Plasmaquin have given excellent results in the treatment of malaria in certain stages of the disease, intensive efforts are still being made to discover, if possible, more effective preparations for the control of this disease.

Farmers sometimes grumble about the slow progress made at Onderstepoort with the control of stock diseases. They should remember that, although excellent facilities exist at Onderstepoort for this type of work, the research worker has to deal with peculiar living things which vary from time to time and under different local and climatic conditions. These are factors which impede progress and render research work difficult and often very discouraging in spite of the numerous experiments which are regularly undertaken. Germs and parasites are most peculiar organisms, and some have great powers of resistance even under unfavourable climatic conditions and against remedies which can be applied with excellent effect against other organisms. On the other hand, it should be borne in mind that many human beings or animals recover from or become immune to diseases without the application of any kind of treatment worth the name. For this reason it is essential that, whenever an experiment is being conducted, with a new remedy, a large number of animals should be used as controls, i.e., left without treatment in order to confirm the value of the remedy.

It is well-known that all livestock remedies sold in the Union must be registered under the Fertilizers, Farm Foods, Seeds and Pest Remedies Act (No. 21 of 1917), the main purpose of which is to protect the farmer by preventing the sale of harmful and ineffectual remedies. Registration of a remedy, however, by no means implies that it is recommended by the Department; it merely means that, in the opinion of professional men such a remedy will not be harmful if used correctly, and that it should prove effective to some extent.

The Department cannot possibly test all remedies submitted for registration, since the testing of a remedy, as indicated above, is a very complicated and long process. A remedy against blowflies, e.g., is expected (1) to kill the maggots on infested sheep, and (2) to prevent reinfestation. Testing for (1) is a comparatively easy and quick process, but in regard to the second requirement the remedy must be applied extensively, under various climatic conditions and in different parts of the country at a time when attacks by blowflies are very severe. Definite results can, therefore, be obtained only after long continued and laborious effort. In testing most remedies, it is also necessary to leave a sufficient number of animals untreated for control purposes, in order to determine whether they will recover without treatment. Take, for example, bluetongue in sheep. It is a well-known fact that during some seasons this disease occurs in a much more severe degree than at other times. If a remedy should prove effective against light attacks at a time when no untreated controls are used, the test would be valueless. It would be necessary to wait until a severe attack occurs, when at least 200 sheep should be treated with the remedy and a further 200 left untreated. If, say, 180 of the treated animals recover and 100 or more of the untreated animals die, the remedy would appear to be promising, but even in such a case it would be necessary to test its effectiveness on a large scale in different

parts of the country and on sheep differing widely as regards breed, age, feed, worm infestation, etc., before a final opinion can be expressed on its merits.

It is the large-scale tests of this nature, which are in fact carried out by the farmers in practice when using the remedy under widely varying conditions, which always focus attenton on new aspects of the disease or its treatment, and consequently give rise to continuous further research work on the remedies and vaccines issued by the Division of Veterinary Services. The remedies and vaccines are built up by the veterinary experts in the course of prolonged research and numerous tests in the laboratories and on farms, until the specific appears to be suitable for issue to farmers. It is impossible, therefore, to know beforehand what defects may become apparent when millions of doses of the remedy are administered under the most widely varying conditions throughout the country, but as soon as such defects occur, the research work once again bends to the task of adapting the remedy to the conditions.

(Dr. Gilles de Kock, Deputy Director of Veterinary Services, Onderstepoort).

The Story of the Wattle.

THE importance of the wattle in the tanning industry is comprehensively dealt with by Dr. S. G. Shuttleworth, in a bulletin recently published by the Department.

The history of leather manufacture is traced from its association with the lives of the first man and woman. It is shown how the early tanner established himself near the tannin-bearing forests so as to have an abundant supply of tannin for leather making. A new development has come with modern mechanisation where the tannin is extracted in the forests and transported perhaps thousands of miles to the tannery. The latest development is the wattle industry, where the tanner is no longer dependent on indigenous forests, but on wattle tannin grown to suit his requirements.

This history is followed by informative sections dealing with the properties of watttle tannin, including chemical composition, colour, astringency, rate of penetration, yield of leather and economy of material. The available scientific data is extensively quoted to show the comparison between wattle and other tannins. Finally the bulletin contains sections dealing with the blending and the optimum use of wattle for leather manufacture. In speculating on the prospects of the wattle industry, the writer comments on the progressive research policy being adopted, and anticipates a sound and steadily expanding future.

"The Story of the Wattle", by S. G. Shuttleworth, Ph.D., A.I.C., A.B.S.I. (Professional Officer, Division of Chemical Services, and Director, Leather Industries Research Institute, Grahamstown, South Africa), is obtainable from the Division of Chemical Services. Price 3d.

Studies on Merino Wool Production.

The Standard of Production of a Group of Plainbodied Stud Ewes.

Dr. V. Bosman, Senior Wool Research Officer, Onderstepoort.

THE relative standards of wool production of plainbodied and developed stud sheep have been, and still are, a controversial topic among sheep breeders. Some contend that a certain amount of development is necessary to maintain the desired compactness of the fleece and quantity of wool, others believe that the plainbodied animal can possess the same compactness and quantity of fleece as the developed type. In general, most sheepmen agree than skinfolds are undesirable from practical standpoints and, if it were possible to eliminate skinfolds, without impairing the quantity, compactness and the quality of the merino fleece, skinfolds should disappear.

Since there are still differences of opinion among practical men on the utility or otherwise of skinfolds and wrinkles, research work into the standards of production of different merino types and relevant aspects has been undertaken.* The results, here outlined, describe the laboratory fleece analyses and the standard of wool production of a group of extremely plainbodied stud ewes.

Material and Methods.

(*a*) *Sheep Used.*—Fifty stud ewes of an extremely plainbodied type, that is, devoid of any development, even of neckfolds, were used in a special test for wool production. The sheep, shown in the illustrations, were obtained from a breeder who had for at least ten years consistently bred this type of sheep. The stud comprises about 4,000 to 5,000 stud ewes all of one type, no other type being tolerated.

In selecting the ewes, care was taken to choose indivduals which were typical of the stud as a whole, including the stud rams.(1) The system of breeding followed was to mate extremely plainbodied stud rams to extremely plainbodied stud ewes. The characteristics of the parents were successfully transmitted to the progeny.(2)

(b) *Management of the Sheep.*—All sheep were run on Karroo pasture and in the same flock and they received no supplementary feeding.

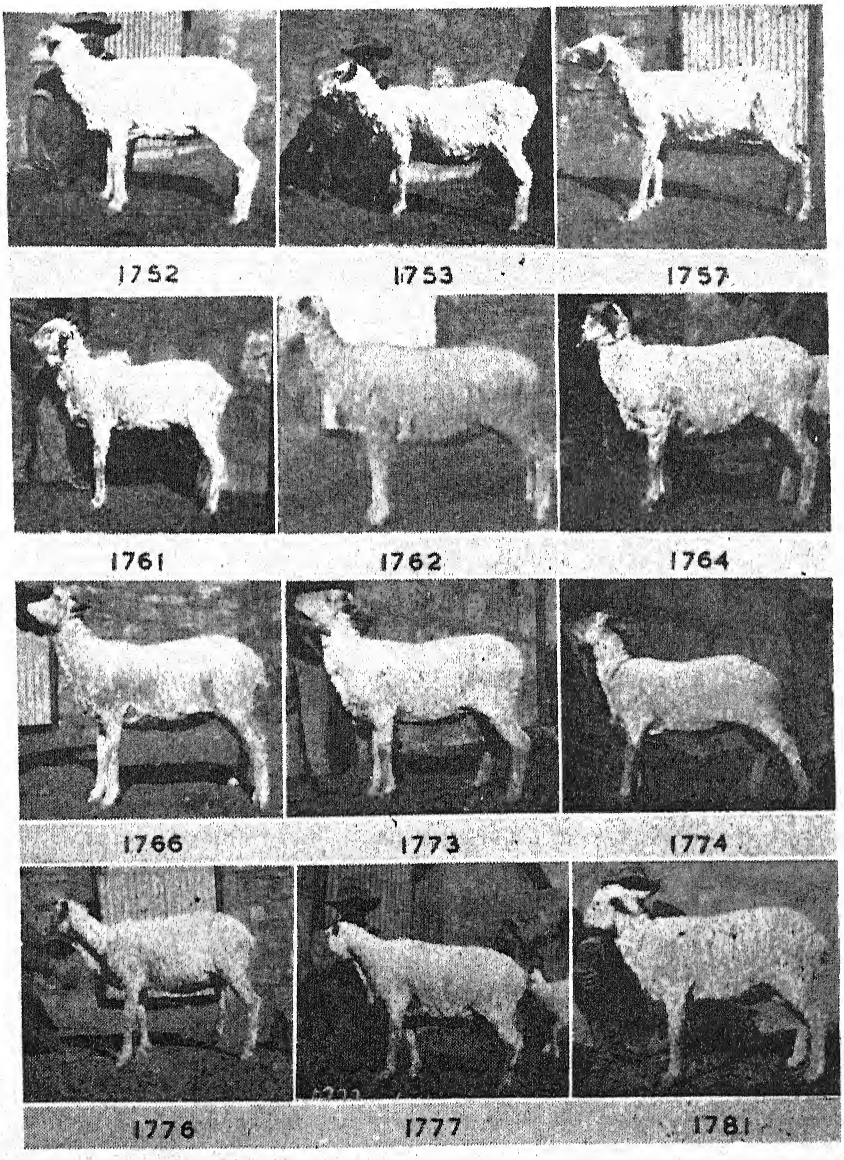
* A series of publications on this topic is given in more detail in the *Onderstepoort Journal of Veterinary Science and Animal Industry* (1942).

(1) Stud rams used in 1941 are illustrated in "Studies on Merino Wool Production: II—Fleece Density Tests on a Group of Extremely Plainbodied Stud Rams." (*Onderstepoort Journal of Veterinary Science and Animal Industry*, 1942.)

(2) An illustration of the prepotency for plainness of some of the experimental animals under observation is given in "Studies on Merino Wool Production I." Refer to "Plainbodied and Developed Merino Sheep. I.—The standard of production of a group of plainbodied stud ewes." (*Onderstepoort Journal of Veterinary Science and Animal Industry*, 1942.)

The animals were subjected to conditions usual to farming practice such as the rearing of lambs, crutching, etc. Over 90 per cent. of the ewes lambed, a fact which would adversely influence the wool production of the group.

(*c*) *Shearing and Sampling.*—On 6 August 1939, 35 young merino stud ewes, with ages ranging from 12-14 months, were shorn under the supervision of the author, the object being to make sure



Extremely plain-bodied stud ewes. Their fleece analyses are given in Table 1.

that they were properly shorn on that date. The ewes were again shorn under the supervision of the author on 8 August 1940.

Each shorn fleece was labelled and packed in a linen bag, and submitted for laboratory testing. In addition, fleece density samples were taken by the Density Caliper.

On 8 August 1940 another group of 15 young stud ewes, ranging in ages from 12 to 14 months, was shorn under the supervision of the author. These were again shorn on 5 August 1941 and the fleeces submitted for testing at the Onderstepoort Wool Research Laboratories. Both groups, the one recorded in 1940 and the one recorded in 1941, were four-toothed ewes when tests were made. The results of the tests are given in Table 1.

(*d*) *Identity of the Sheep by Nose Prints.*—It has been shown * that the nose-printing of merino sheep serves as an infallible means of identification and this has been successfully applied to the recording of merino sheep in wool-production tests. Every sheep used in this experiment was recorded by nose-prints at each shearing and its identity checked from shearing to shearing.

(*e*) *Photographic Records.*—A photographic record of each animal was taken immediately after the sheep had been shorn. This method shows the true plainness of the skin of the sheep, in contrast to an apparent, deceptive, plainness of sheep that have a twelvee months' wool growth.

The photographic records (see illustrations) show the ewes to be exceptionally smooth skinned and devoid of body folds and neck fronts. They have strong constitutions and good conformations, characteristics typical of their type.

(*f*) *Laboratory Analyses.*—The fleeces and samples were analysed for:—

(1) Fleece weights, both greasy and clean washed and for yield. It has been shown that since the greasy merino fleece consists of impurities such as sand, grease, suint and vegetable matter, the total quantity of wool produced by thee sheep must be on a clean basis. To illustrate this point an example is quoted of two stud ewes A and B. A gave 19 lb. of greasy fleece, B gave 13 lb. of greasy fleece. On test, A gave 6·8 lb. of clean dry wool, while B gave 7·3 lb. of clean dry wool. Although A gave more greasy wool, it actually gave less scoured wool than B, the difference being in their respective yields, that of A being 36 per cent. and that of B, 56 per cent.

(2) The number of fibres growing per square inch of skin on the shoulder regions.

(3) The average staple length of each fleece.

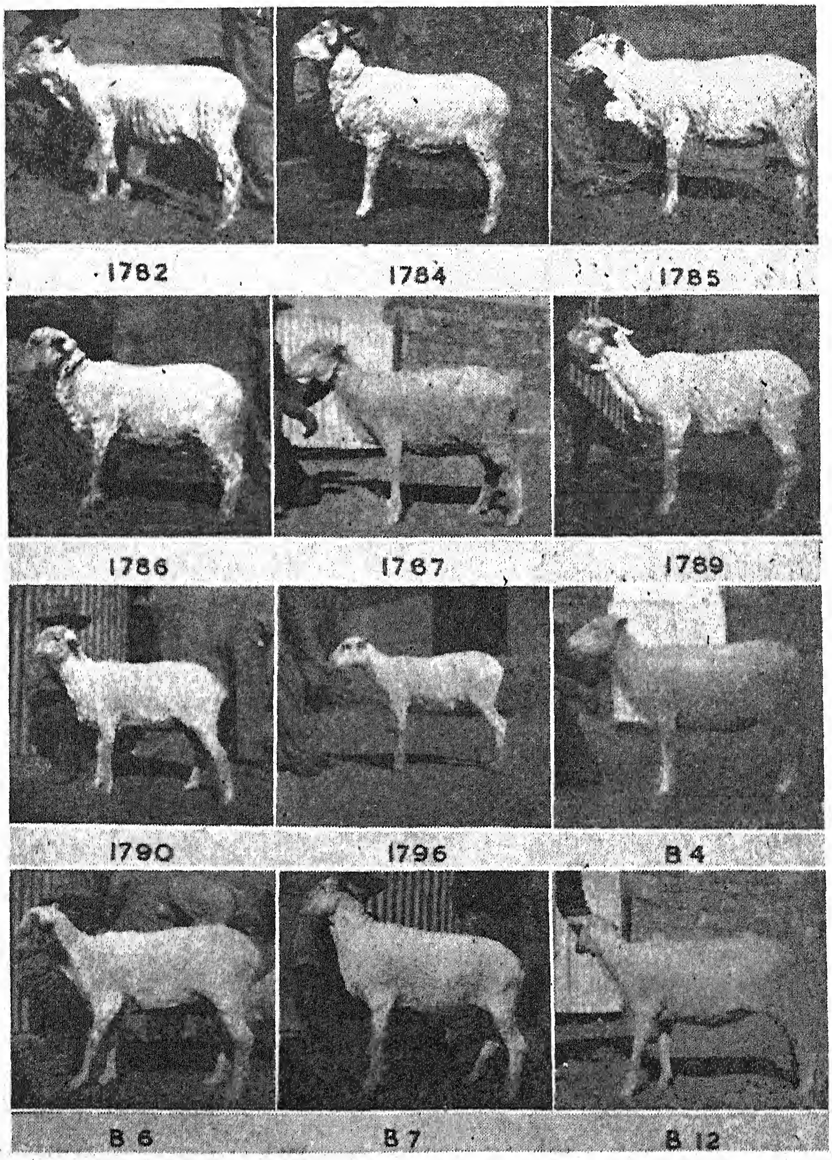
(4) The average fibre fineness of each fleece and its quality number.

The Total Quantity of Wool Produced.

Group A, consisting of 35 stud ewes and shorn in 1940, were all four-toothed sheep at the time of recording. They had a 12 months'

* "The Recording of Merino Sehep by Nose Prints"—V. Bosman, *Farming in South Africa*, February 1941.

wool growth and produced greasy fleece weights ranging from 10·47 lb. to 17·64 lb. with an average of 13·28 lb. for the group. Their scoured fleece weights ranged from 5·67 lb. to 10·47 lb.* of clean



Extremely plain-bodied stud ewes. Their fleece analyses are given in Table 1.

* During the past six years that fleece testing for merino breeders has been in progress at the Onderstepoort Wool Research Laboratories, over 1,500 tests from diffeent sources have been made on merino ewes. The production of 10·47 lb. bone dry (or 12·14 lb. on the Regain basis) has not yet been surpassed for stud ewe production.

wool (bone dry) with an average production of 7·47 lb. as bone dry (or 8·7 lb. of clean at 16 per cent. Regain).

Group B, consisting of 15 four-toothed ewes and shorn in 1941, gave greasy fleece weights ranging from 11·03 lb. to 15·59 lb. with an average of 12·17 lb. The scoured weights of this group ranged from 6·15 lb. to 8·44 lb. with an average of 6·99 lb. on the clean bone-dry basis (or 8·1 lb. on the regain basis).

The average production of the 50 ewes was 12·95 lb. in the grease, with 7·33 lb. of clean dry wool (or 8·5 lb. on the Regain basis). A production of 12·95 lb. means that about 22 unskirted (or 25 skirted) fleeces are necessary to fill a bale weighing 300 lb. (Approximately 46 fleeces of the size of the Union's average fleece, i.e., 6½ lb., are required to fill a bale of 300 lb.)

The Yield of the 50 fleeces (given in the 4th column of Table 1) is expressed as—

$$\frac{\text{the weight of clean dry wool}}{\text{Wt. of greasy wool under air conditions}} \times 100$$

and ranges from 53 per cent. to 64 per cent. with an average of 58·3 per cent. The latter figure, on the 16 per cent. Regain basis (the Bradford System) or as—

$$\frac{\text{the weight of clean wool at 16 per cent. Regain}}{\text{Wt. of greasy wool under air conditions}} \times 100$$

gives an average of 67·6 per cent.

The Staple Length of each fleece taken on the shorn fleece is an average of 10 measurements of the fleece. The average staple lengths of the 50 ewes ranged from 3·2 to 4·5 inches with an average for the group of 3·9 inches. It is significant to note that it is possible for the merino sheep to grow a fleece with an average staple length of 4·5 inches in 12 months. The average staple length for the group of 3·9 inches for a twelve months' growth suggests the shearing of these sheep when they have an 8 to 9 months' growth in order to obtain an " A " length of 2¾ to 3 inches.

Fleece Densities on Shoulder Regions.—An analysis of the fleece densities on shoulder regions is given in columns 8, 9 and 10 of Table 1.

The number of fibres growing per square inch of skin of the 50 ewes ranged from 30,200 to 71,600 with an average of 43,100.

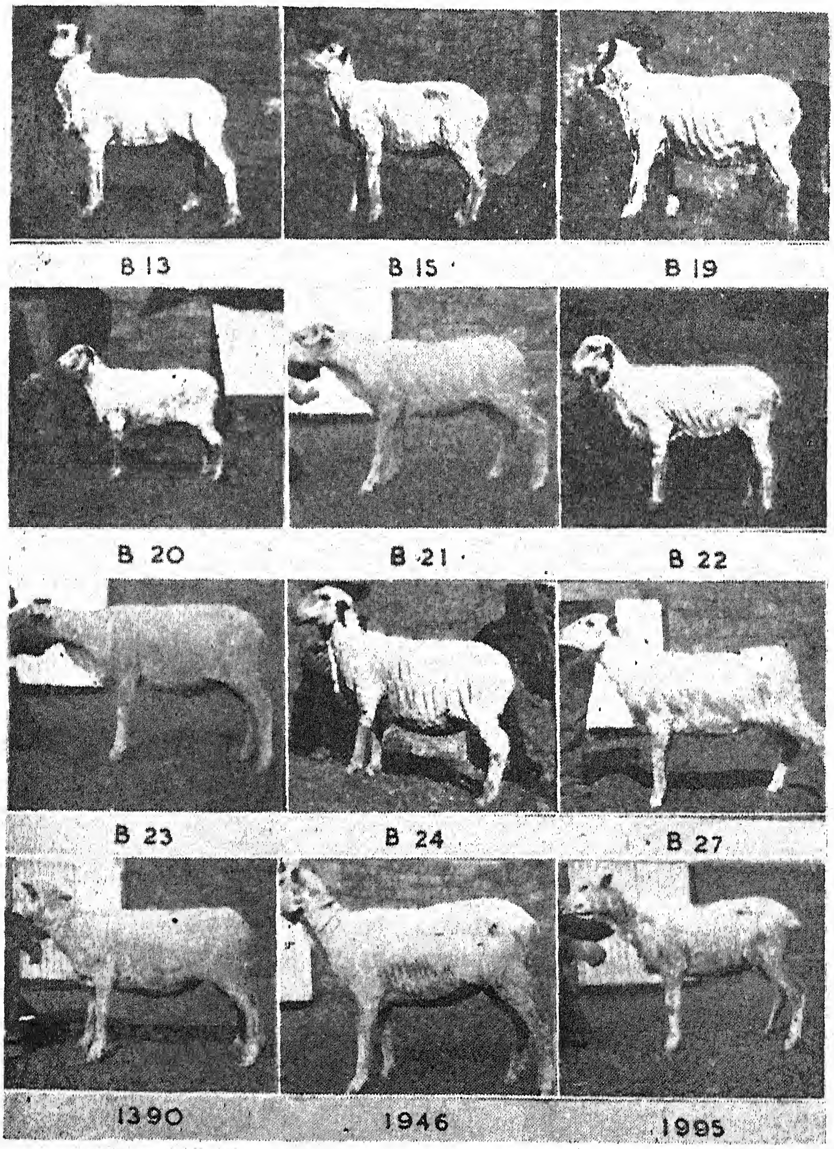
The values for the fibre fineness, given in column 9, are necessary in the calculation of the fleece density when it is expressed as the percentage skin area occupied by wool fibre.*

The values for the fleece density ranged from 1·66 per cent. to 3·93 per cent. with an average of 2·52 per cent. This confirms a previously obtained conclusion that at a maximum only from 3 per cent. to 4 per cent. of the merino skin surface is covered by wool fibre, so that 96 per cent. of the skin bears no wool.

* It has been shown that the number of fibres per square inch of skin alone does not represent the true fleece density, but it is the number of fibres per unit area in conjunction with the fibre fineness expressed as the per cent. skin area occupied by wool fibre.

Discussion.

Many sheepmen believe that a certain amount of skinfolding in the merino is necessary for producing fleeces that are bulky and dense. This contention has played an important part in determining the breeding policies of certain studs. Other sheepmen, however, contend that plainbodied sheep can produce as bulky and as dense fleeces as their developed comrades. In consequence, this topic has



Extremely plain-bodied stud ewes. Their fleece analyses are given in Table 1.

long been a controversial one among sheepmen, and differences of opinion are probably due to a lack of reliable tests on the standards of merino wool production, in relation to the type, and also to a lack of knowledge of the detailed factors that control production.

This position has prompted more research, particularly on methods of measuring the fleece characteristics, and has also resulted in large-scale laboratory testing of merino fleeces in such characteristics as total wool production (greasy and clean), yield, length, number of fibres growing per square inch of skin, fleece density and fibre fineness. The work here outlined gives an example of how the merino fleece can be analysed when critical comparisons for stud sheep are required.

The results give an analysis of an extremely plainbodied group of stud ewes from a breeder who has consistently selected and bred for extreme plainness, and at the same time has paid attention to the quantity and the compactness of the fleece.

This breeder has followed a system of breeding " like to like ", both rams and ewes being of an extremely plainbodied type, and producing extremely plainbodied progeny. This method of breeding differs from that of other stud breeders who follow a system of " corrective mating ". The belief is also held by some merino breeders that development in the studs is necessary for maintaining density and quantity of fleece in the progeny of these studs, the progeny being plainbodied animals and used for flock improvement. Many of these sheepmen believe that the system of consistently mating extremely plainbodied stud rams to extremely plainbodied stud ewes will eventually produce inferior fleeces that lack bulk, fleece density and quantity of wool. From this aspect the results of the plainbodied stud tests here outlined are important.

A summarized review of some of the available wool production figures of stud ewes, compared with the results of the sheep under discussion, is given in Table II.

Table II shows that the production of sheep described in this article compared favourably with the production of stud ewes from other sources.

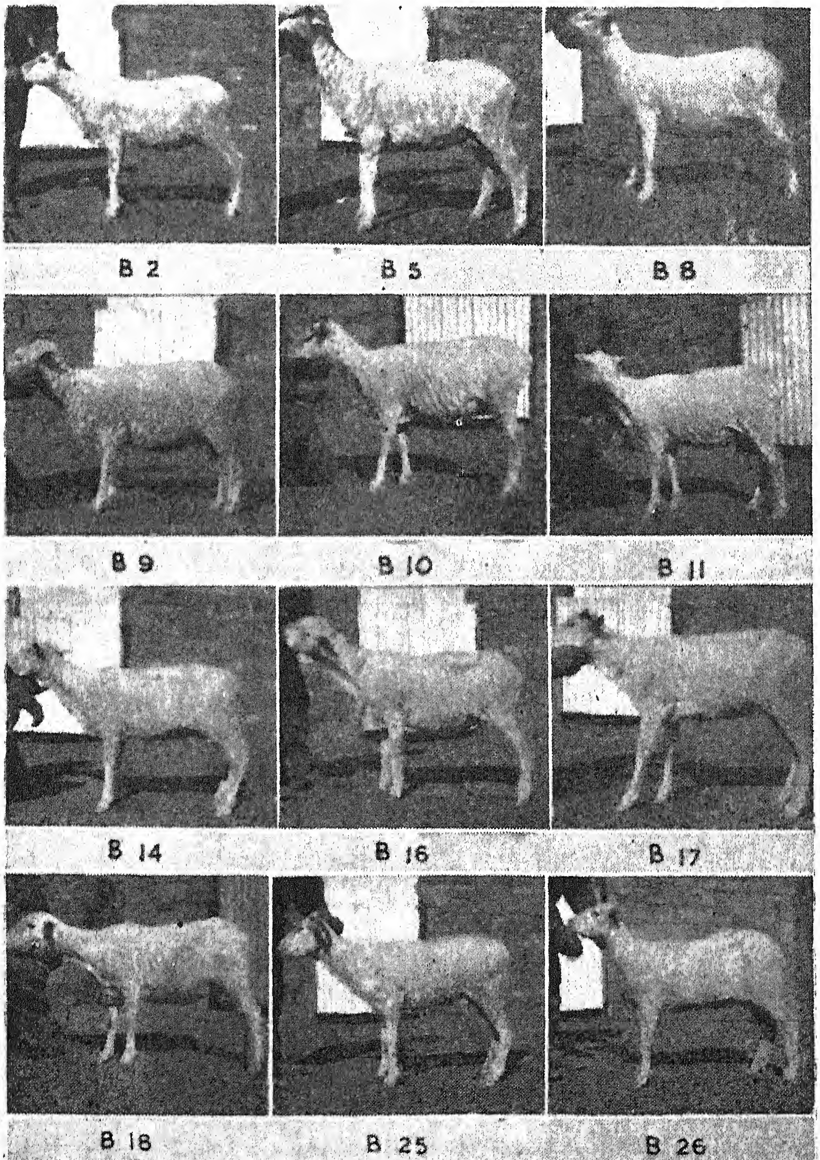
It has always been held by sheepmen that fleece density constitutes one of the main differences between " flock " sheep and " stud " sheep, and in a former article that discusses the classification of merino sheep into these two classes it has been shown* that " flocks " produce from 15,000 to 25,000 and " studs " produce from 30,000 to 60,000 fibres per square inch of skin.

On this basis, the density of the ewes here described with 43,100 fibres per square inch of skin and a fleece density of 2·52 per cent. constitutes a good stud standard.

The standards of excellence of the fleeces of the 50 plainbodied ewes in regard to the quantity of wool, the fleece density and the

* " Fleece Density in the Merino Sheep "—V. Bosman, *Farming in South Africa*, March 1934.

length, show the sheep to possess a good stud standard of production and the contention so frequently held by sheepmen that plainbodied sheep must necessarily have inferior fleeces cannot be substantiated. This confirms a similar conclusion previously recorded by the author (1937) and also that obtained by research workers in Australia and America.



Extremely plain-bodied stud ewes. Their fleece analyses are given in Table 1.

TABLE 1.—*The fleece analyses of groups of plainbodied ewes shown in the illustrations. The records show the fleece weights, greasy and clean, yield, average staple length, average fibre fineness and the quality number of the fleeces. In addition, the fleece densities on the shoulder regions are analysed as the number of fibres growing per square inch of skin and the percentage of skin area occupied by wool fibre.*

Sheep No.	Total Wool Produced (365 days).			Average Values for Whole Fleece.			Fleece Densities on Shoulder Regions		
	Grease Weight (incl. lox).	Scoured Weight (bone dry).	Yield of Fleece (excl. lox).	Staple Length (Inch).	Fibre Fineness.	Quality Number.	Number of fibres per sq. inch of Skin.	Fibre Fineness.	Fleece Density as Per Cent. Skin Area occupied by Fibre
1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
GROUP A (recorded in 1940. 4-toothed)									
1752..........	15·06	8·81	62·0	4·2	21·9	60's	51,200	21·9	3·08
1753..........	11·43	6·61	59·0	3·7	23·4	58's	39,900	23·1	2·68
1757..........	15·13	7·88	54·2	4·3	21·1	64's	40,400	22·8	2·60
1761..........	14·10	8·65	63·1	4·3	22·5	60's	43,000	21·4	2·44
1762..........	11·70	7·07	61·9	3·8	22·4	60's	54,100	21·7	3·15
1764..........	11·42	7·04	62·9	4·2	22·5	60's	41,800	21·7	2·46
1766..........	13·36	7·87	62·4	3·9	22·0	60's	43,100	21·1	2·41
1773..........	12·86	7·49	59·4	4·3	22·3	60's	50,300	21·8	2·97
1774..........	11·70	6·02	53·3	3·2	22·7	60's	41,300	22·6	2·62
1776..........	13·62	8·43	64·0	4·5	24·1	58's	37,800	22·7	2·41
1777..........	13·18	6·73	58·2	3·8	25·7	56's	34,500	24·7	2·63
1779..........	15·58	8·50	56·5	4·2	22·1	60's	45,400	21·1	2·52
1781..........	17·64	10·47	60·8	4·0	22·5	60's	49,200	20·9	2·69
1782..........	14·97	7·26	54·1	4·5	21·9	60's	39,300	21·6	2·31
1784..........	12·89	7·43	59·5	3·9	24·1	58's	33,600	24·3	2·45
1785..........	14·02	7·98	58·9	4·1	23·2	58's	52,900	21·9	3·21
1786..........	13·26	6·81	53·0	3·5	22·2	60's	49,700	21·7	2·91
1787..........	17·55	9·76	59·3	4·2	22·7	60's	34,700	22·3	2·19
1789..........	13·76	7·29	55·5	3·7	23·5	58's	44,400	20·3	2·27
1790..........	14·52	7·88	56·1	4·2	22·1	60's	38,300	21·2	2·15
1796..........	12·66	6·91	56·2	3·6	23·0	60's	38,100	22·8	2·47
1798..........	12·36	6·59	55·8	3·7	22·1	60's	47,100	21·2	2·64
B. 4..........	11·91	6·87	58·7	4·0	23·5	58's	40,800	22·6	2·57
B. 6..........	11·64	7·00	61·4	4·1	21·4	60's	39,800	22·0	2·40
B. 7..........	14·75	7·60	54·0	3·7	22·1	60's	34,500	20·4	1·78
B. 12..........	11·02	6·14	57·8	4·1	23·1	58's	37,800	22·5	2·38
B. 13..........	13·99	8·55	63·8	3·8	25·5	58's	48,700	24·2	3·60
B. 15..........	13·75	7·61	57·3	4·5	23·1	58's	47,200	21·3	2·68
B. 19..........	11·40	6·62	59·7	4·1	23·3	58's	35,800	22·7	2·30
B. 20..........	10·47	5·67	55·4	3·8	23·8	58's	31,700	24·6	2·40
B. 21..........	12·01	6·94	58·8	3·8	21·8	60's	39,800	21·2	2·24
B. 22..........	11·74	6·69	58·5	4·0	21·7	60's	39,100	19·8	1·93
B. 23..........	12·75	6·63	54·2	3·6	22·0	60's	39,300	20·2	2·05
B. 24..........	14·16	8·17	60·0	4·1	22·9	60's	35,600	21·1	1·99
B. 27..........	12·56	7·62	62·8	4·5	24·1	58's	36,800	22·2	2·26
AVERAGES...	13·28	7·47	58·4	4·0	22·8	60's	41,600	22·0	2·51
St. Dev........	1·698	1·016	3·35	0·31	1·04	—	5,930	1·20	0·378
Coeff. of Var. %	12·8	13·6	5·7	7·8	4·5	—	14·3	5·5	15·1

TABLE 1 (*continued*).

Sheep No.	Total Wool Produced. (365 days.) Grease Weight (incl. lox).	Scoured Weight (bone dry).	Yield of Fleece (excl. lox).	Average Values for Whole Fleece. Staple Length (inch).	Fibre Fineness.	Quality Number.	Fleece Densities on Shoulder Regions. Number of fibres per sq. inch of Skin.	Fibre Fineness.	Fleece Density as Per Cent. Skin Area occupied by Fibre.
1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
GROUP B (recorded in 1941. 4-toothed).									
1946..........	15·59	8·44	55·2	3·9	23·2	58's	45,200	21·0	2·49
1995..........	11·68	6·25	54·9	3·5	22·0	60's	54,900	20·4	2·85
B. 2..........	11·81	6·92	59·3	3·6	23·2	58's	43,300	22·4	2·71
B. 5..........	11·36	6·22	56·1	3·6	21·2	64's	51,900	20·5	2·81
B. 8..........	11·44	6·63	59·3	3·7	21·5	60's	47,300	19·8	2·35
B. 9..........	11·20	6·43	58·4	3·7	22·6	60's	30,200	21·0	1·66
B. 10..........	11·81	6·86	58·9	3·8	22·8	60's	34,600	21·6	2·02
B. 11..........	11·03	6·15	56·5	3·7	21·9	60's	56,600	20·7	3·02
B. 14..........	12·45	7·47	61·0	3·8	21·8	60's	71,600	20·9	3·93
B. 16..........	13·15	7·01	55·4	3·8	21·6	60's	55,600	19·6	2·71
B. 17..........	12·51	6·74	55·5	3·9	23·2	58's	37,000	22·3	2·32
B. 18..........	12·40	7·27	59·2	3·8	23·4	58's	35,500	20·8	1·92
B. 25..........	11·77	7·29	62·7	4·0	20·2	64's	53,800	19·1	2·42
B. 26..........	12·97	7·15	56·4	3·9	22·3	60's	45,000	20·8	2·43
C. 100..........	11·37	7·96	62·0	4·0	23·5	58's	37,900	22·7	2·43
AVERAGE....	12·17	6·99	58·1	3·8	22·3	60's	46,700	20·9	2·54
St. Dev........	1·143	0·646	2·56	0·15	0·95	—	10,940	1·02	0·531
Coeff. of Var. %	9·4	9·2	4·4	3·9	4·3	—	23·4	4·7	20·9
Average of Groups A and B...........	12·95	7·33	58·3	3·9	22·7	—	43,100	21·7	2·52
St. Dev........	1·625	0·942	3·11	0·29	1·03		8,010	1·25	0·424
Coeff. of Var. %	12·5	12·9	5·3	7·4	4·6	—	18·6	5·7	16·8

It is concluded that fleece density and bulk of fleece can be obtained without the aid of skinfolds and such plainbodied sheep not only produce profitable fleeces, but with their strong constitutions and smooth skins have all the practical advantages possessed by the plainbodied type. Some advantages of this type chiefly concern such aspects as strong constitutions and, in addition, better hamels, more lambs, better pelts (it has been shown that pelts from developed sheep are inferior), less blowfly trouble and more uniform fleeces.

TABLE II.—*Some available published figures of fleece analyses of merino stud ewes.*

Source Author.		Average Fleece Weight. (lb.)	Average Fleece Weights (scoured). (lb.)	Number of Fibres per sq. inch of Skin.	Average Fleece Density. (%)	Feeding Conditions.	Number of Fleeces Tested.
Belchner and Carter (1936)	I	12·20	7·53	—	—	Australian (New South Wales) stud sheep pastures; sheep lambed	64
	II	12·18	7·28	—	—		54
	III	12·73	7·70	—	—		60
	IV	12·65	7·51	—	—		59
Bosman (1937).......		15·6	7·1 at 16% regain 6·1 bone dry	46,500	2·28	Karroo pastures; sheep lambed	26
South African Breeders' Advertisements	I	15·25	7·9 at 16% regain 6·8 bone dry	—	—	—	4,470
	II	14·0	—	—	—	—	2,000
Experimental Ewes tested at Onderstepoort (Results unpublished)	I	14·63	8·13 at 16% regain 7·01 bone dry	—	—	Stall-fed on a sufficient balanced ration; no lambing	46
Plain-bodied ewes in this publication	I	13·28	8·7 at 16% regian 7·47 bone dry	41,600	2·51	Karroo pastures; sheep lambed	35
	II	12·17	8·1 at 16% regain 6·99 bone dry	43,100	2·52	Karroo pastures; sheep lambed	15

Summary and Conclusions.

The wool production and fleece analysis of 50 extremely plainbodied stud ewes are given. The ewes were typical of the sheep of the stud (including the stud rams) and were obtained from a breeder who had consistently bred for extreme plainness, so that this characteristic is being successfully transmitted to the progeny.

Thirty-five four-toothed stud ewes, recorded in 1940, gave an average greasy fleece of 13·28 lb.; a clean scoured fleece of 7·47 lb. as bone dry (or 8·7 lb. at 16 per cent. Regain); a yield of 58·4 per cent. as dry (or 67·7 per cent. on the Bradford system); an average staple length of 4·0 inches and a 60's quality number.

Fifteen four-toothed stud ewes, recorded in 1941, gave an average greasy fleece weight of 12·17 lb. with 6·99 lb. of clean scoured wool as bone dry (or 8·1 lb. of clean wool at 16 per cent. Regain). The yield was 58·1 per cent. as dry (or 67·3 per cent. on the Bradford system). The average staple length was 3·8 inches and the quality number a 60's.

The number of fibres growing per square inch of skin for the 50 ewes ranged from 30,200 to 71,600 with an average of 43,100. The average fleece density was 2.52 per cent.

It is concluded that the extremely plainbodied stud ewe here described possesses a good stud standard of production in regard to the total wool, the length, and the fleece density.

The view held by many sheepmen that extremely plainbodied sheep must necessarily have inferior fleeces cannot be substantiated.

Not only do these sheep produce profitable fleeces, but by virtue of their smooth skins and strong constitutions, they possess the practical advantages of the plainbodied type.

Provision against Drought.

Prof. A. M. Bosman, Director of Animal and Crop Production.

AS a result of the severe drought which prevailed during the planting season in some of the best grain-producing areas of the Union, the Department of Agriculture and Forestry made a serious appeal to farmers to do all in their power to plant immediately after the first rains such grain crops as are suitable for human consumption and to concentrate on those varieties which would still have a reasonable chance of maturing. Should it, for instance, be too late to plant late-maturing varieties of maize, farmers were advised to plant early-maturing varieties or beans and other rapidly maturing crops.

This appeal was made to ensure the maximum production of food for human consumption in spite of the drought. The Department itself assisted by making tractors available for ploughing in certain areas.

Saving Crops from Early Frost.

The farmers responded to the appeal and exerted themselves to the utmost to plant on as extensive a scale as possible. It is only natural to expect that many lands were planted in the hope that the first frost would not appear until maize and other cereal crops had matured. From the beginning of April, when frost can be expected in some of our cropping areas, farmers will watch the weather with concern, hoping that the frost will stay away.

It is possible, however, that early frost will dash their hopes, and the Division of Animal and Crop Production feels that, especially in such an eventuality, special precautions should be taken to ensure that the entire crop will not be lost. If a grain crop is killed by frost in its immature stage it becomes practically useless for man and beast.

In cases where there is a possibility that the crop may be killed by frost, precautions should be taken to convert the crop into some other substance such as silage or hay whereby the greater part of its value can be preserved.

At this time of scarcity of animal products such as milk, meat and eggs, and with the lessons of the recent drought which claimed thousands of victims still impressed on their minds, farmers will readily appreciate the value of silage. Silage of good quality is an excellent feed, particularly for cattle but also for sheep.

In these circumstances, farmers are most strongly advised to take immediate precautions for ensiling those crops which were originally intended for grain, but which are at present in danger of being damaged by frost.

Subsidy on Silos.

In order to afford farmers an opportunity to make silage, the Government has decided again to grant a subsidy on silos as from 1 February 1942, payable after 1 April 1942.

The subsidy will be based on the final valuation of silos which have been completed to the satisfaction of the Department of Agriculture and Forestry. The construction should not have been commenced prior to 1 February 1942, and application for payment of a subsidy for the construction of a silo should be made on the prescribed form which should immediately be submitted, duly completed, to the local Magistrate or Extension Officer, or to Principals of Agricultural Colleges or the Chief, Division of Soil and Veld Conservation, Pretoria.

If a farmer has no silo on his farm and the limited time available does not permit him to build a tower silo or line a pit silo with brick or stone, one of the following methods may be adopted:—

(1) If the nature of the soil is such that crumbling or falling in will not readily take place, a trench may be dug. The excavation should be at least 8 ft. to 10 ft. deep and, if the side walls cannot be lined with stone, they should be made as smooth as possible in order to exclude air.

(2) If the excavation cannot be completed in time, a stack silo may be built. In making a stack silage, wastage along the sides and on top naturally occurs as a result of direct contact with the air. The wastage can, however, be considerably lessened, if care is taken to ensure that the stack is well compacted and if one large stack is made in preference to numerous smaller ones, so as to minimize *percentage* loss. The stack should be compacted by weighting it down with stones or similar heavy objects.

Making of Silage.

In connexion with the ensiling of maize and other grain crops, which may not yet have reached the desired stage of maturity, care should be taken not to ensile the material while its water content is still high, since this will render the product somewhat acid.

Silage may be made from a great variety of crops, including maize, kaffircorn, amber cane, sunflower, babala, grass and also legumes such as soybeans and cowpeas, etc. In the case of legumes, it is necessary either to mix the material with a crop such as maize or to spray it with molasses when ensiling the crop in order to prevent bad fermentation.

Even maize slightly damaged by frost lends itself to the production of good silage, provided the material is cut as soon as possible after the first frost has fallen and water is added to counteract the desiccation which then takes place.

It is impossible to discuss all particulars of silage making in this article and farmers inexperienced in the art should consult their nearest Extention Officer or Agricultural College for further particulars. All farmers are, however, requested to do everything in their power to prevent the killing by frost of valuable ensilage

material on their lands. In the form of silage the material will be of immense value to themselves and to the country, whereas if it is killed by frost it is almost valueless as a food for either man or beast. All farmers who make silage for the first time this year (perhaps under stress of circumstances) and who will then realize the value of the product as an animal feed in winter and in times of drought, will probably never again be without it. If that happens it will be a boon to themselves and the drought-stricken areas of our country in general.

Particulars of Scheme.

Particulars of the State-aided scheme for the construction of silos are as follows:—

In order to enable farmers to submit application as from 1 February, it has been decided to utilize the old form U.A.D. 601 with certain modifications, and farmers are requested to note that, unlike the previous one, the present scheme does not include stock sheds and machinery.

The scheme makes provision for the payment of a bonus of 25 per cent. on the final valuation of silos previously approved by the Department, and built subsequent to 1 February 1942. The reparation, improvement, completion or extension of an existing silo does not fall within the scope of this scheme.

The bonus payable on approved silos will not exceed £50 per farm, and if a farmer wishes to construct silos on more than one of his farms, the total bonus payable to him will not exceed £100.

Any farmer wishing to avail himself of these facilities should apply in advance, since bonuses will be paid only on silos approved by the Department and completed to its satisfaction.

Application for the construction of silos should be made on form U.A.D. 601 and submitted in triplicate. For silos on separate farms seperate application forms must be completed. These application forms are obtainable from magistrates, extension officers, agricultural colleges and the Division of Soil and Veld Conservation, P.O. Box 965, Pretoria. Until such time as new forms are available and a new procedure is adopted, the application forms should immediately be posted to: The Chief, Division of Soil and Veld Conservation, P.O. Box 965, Pretoria.

Immediately after completion of the silos the local extension officer must be notified in order that arrangements may be made for final inspection and valuation. In districts where the services of an extension officer is not available notice should be given to the Principal of the College of Agriculture serving the area, and in the case of Natal and Transvaal, to: The Chief, Division of Soil and Veld Conservation, P.O. Box 965, Pretoria.

Information on specifications and plans for approved and standard silos may be obtained from extension officers, colleges of agriculture or the Division of Soil and Veld Conservation.

Where the Department has approved of the construction of a silo under this scheme, the work must be completed within twelve months from the date of approval. In special cases permission for extension of time may be granted to applicants who apply for extension within the period of twelve months.

Export of Fresh Grapes.

IN a report on the export of fresh grapes during the ten-year period 1930 to 1939, the Chief Government Fruit Inspector makes available such quantitative and qualitative facts concerning grape exports in a form that such points as seasonal fluctuations and the relative importance of varieties and of localities, can be readily determined.

The changes, in the grape export standards, which occurred during the period are given and the affect of these changes on the quality and quantity of the exports are discussed.

Statistical tables in the report include (1) quantities of the chief varieties exporetd annually, 1928 to 1939; (2) total weekly exports, 1930 to 1939; (3) weekly exports of the main varieties (1930 to 1939); (4) relative importance of varieties; (5) total grapes from various localities; (6) relative importance of localities; (7) distribution of varieties; (8) varietal composition of grape exports from each locality; (9) tonnage and percentage of "selected" and "choice" grade grapes exported each year during the period 1931 to 1939; (10) percentage of "selected" grade grapes from various localities; (11) seasonal and mean dates of arrival at the docks for the chief varieties and localities; and (12) tables describing the colour, freshness and size of berry and also the total dissolved solids to acid ratio of the juice.

Further details on the subject are contained in Bulletin 225 "The export of Fresh Grapes from the Union of S.A. during the ten-year period 1930-39, by V. A. Putterill, and obtainable from the Division of Horticulture, Pretoria, at 3d. per copy.

Popular Bulletins.

(1) Calf Rearing—Bulletin No. 224. Price 3d. Obtainable from the Editor, Department of Agriculture and Forestry, Pretoria.

(2) The Export of Fresh Grapes from the Union of South Africa during the Ten-year period, 1930-39—Bulletin 225. Price 6d. Obtainable from the Chief, Division of Horticulture, Pretoria.

(3) Soft Cheese as a Food—Bulletin No. 229. Price 3d. Obtainable from the Editor, Department of Agriculture and Forestry, Pretoria.

Catch Crops.

F. H. Bosman, Senior Research Officer, Grootfontein College of Agriculture.

ON many farms production can be increased by the use of catch crops, by which is meant the growing of crops between the periods when the main crops occupy the land, or in place of crops which have failed as a result of adverse conditions. As a rule they are necessarily early maturing and have to be put in with a minimum of delay in order to ensure maximum returns.

These crops may prove profitable as cash, feed or cleaning crops, or as a means of improving soil fertility, provided sufficient moisture is available. Catch-crop production is greatly restricted by this factor. In areas where a winter cereal constitutes the main crop, successful production is largely dependent on the amount of moisture accumulated in the soil during late summer and autumn, and the use of catch crops will frequently deplete this available soil moisture to such an extent as to cause an appreciable reduction in the yield, or even complete failure, of the following main crop. The same holds true where a summer main crop is preceded by a winter catch-crop.

The catch-crop finds its greatest use where moisture is not a limiting factor, as for example where irrigation water is available to supplement the rainfall or where favourable rainfall conditions exist.

Over the major portion of the area served by the Grootfontein College of Agriculture winter cereals constitute the principal annual crop grown and as a rule little use is made of the land between main crop seasons where conditions allow this to be done.

The limited period available permits only early-maturing crops to be cultivated, and of these, beans are amongst the best adapted for the purpose. Small White Haricot is an early-maturing variety which may be relied on to mature satisfactorily if planted early in January. Sugar beans have a higher market value and may be tried where soil and moisture conditions are favourable and the season is not short. Beans will leave the soil in good condition and an additional advantage is gained if clean cultivation is practised. The desirable soybean varieties are somewhat too late-maturing to be grown for bean production with safety after the end of December, but they can be utilized for hay production, the crop being harvested when the pods have formed. Soybeans withstand slight frosts, which is an advantage they have over beans or cowpeas for late planting. Cowpeas may also be grown for hay, but as a rule will not equal soybeans in yield under these conditions. Maize may be grown between succeeding winter cereal crops for silage, for which purpose early-maturing varieties such as Boesman or Peruvian are recommended.

Late rains may interfere with the curing of the legume crops, in which case they may be ensiled with the maize in the proportion of one part of legume to three or preferably four parts of maize without the addition of molasses.

Where the soil is in poor physical condition, the use of a catch-crop for green-manuring would prove profitable. For this purpose a fairly thickly planted legume such as soybeans should be used.

It is advisable to fertilize the catch-crop unless the preceding crop had received a liberal application of fertilizer.

Catch-crops for use between summer main crops are restricted mainly to the winter cereals for grazing or soiling purposes. Fortunately these crops are of great value in almost every system of farming. Growth is considerably retarded by the low temperatures of mid-winter, and every effort should be made to sow the winter cereals as early as possible, and for this purpose the summer crop should be removed from the land at the earliest opportunity.

Where the soil is clean and in good tilth, the time and cost saved in preparing the seedbed by merely cultivating the soil will often outweigh the advantages accompanying more thorough soil preparation.

With some cultivated crops the winter cereal may be sown at the time of the last cultivation with good results. Of the winter cereals barley will give the earliest grazing, but is the least resistant to low temperatures. Oats is widely used for winter grazing, and for relatively late sowing an early-maturing variety such as Fulghum should be used. At Grootfontein wheat has proved superior to oats for winter grazing from the point of view of yield and cold resistance, and more attention should be given by farmers to this crop. Varieties Red Egyptian, Turkey Red and Oubaard are recommended.

It is necessary to bear in mind that with catch-crops as with main-crops profit or loss is determined largely by careful management and utilization.

Nursery Quarantines.

The following nursery quarantines were in force on 1 January 1942:—

1. Alkmaar Estates, Alkmaar, on citrus (all), for red scale.

2. Municipal Nursery (Fountains), Pretoria, on ornamental (part), for pernicious and white scales.

3. Kildare Nurseries, Pietermaritzburg, on apples (part), for red and pernicious scales.

4. Subkleve's Nurseries, Johannesburg, on deciduous fruit trees (part), for pernicious scale.

The Principles of Plant Protection Against Insects.

Dr. B. Smit, Senior Entomologist, Division of Entomology.

IN protecting plants against the attack of insect pests, a great variety of methods is used and in almost every case the method must be specially chosen and adapted to the particular insect and to the prevailing circumstances. However, there are certain general principles which should be followed, and many farmers and gardeners still seem to have very little understanding of these principles.

In the first place, it is necessary to make a few careful observations and to determine what insect is responsible for the damage and how that damage is being done. For instance, when the leaves of fruit trees are being eaten into holes, the insect responsible may not be present during the day-time, but if a search is made with an electric torch at night a beetle may be found feeding on the leaves. If an insect is found, which cannot be identified easily, then just put it into an empty match-box and send it to the Chief, Division of Entomology, P.O. Box 513, Pretoria, with a description of the circumstances under which it was found.

In the case of biting or chewing insects, such as the beetle referred to above, and in the case of locusts, crickets and caterpillars, one can usually protect plants from attack by using a stomach poison. Such a poison is either sprayed on to the plants, where it remains as a fine deposit on the leaves, ready to be eaten by the insect when it attacks, or it may be made up into a bait with sugar and bran or some other food material and scattered amongst the plants. When sprayed on to living plants, the poison must be harmless to them, and in order to be harmless it must be insoluble—as for instance, arsenate of lead. When making baits, however, a soluble poison such as arsenite of soda may be used, because it does not come into contact with the plants.

Stomach poisons are quite useless against sucking insects, such as aphids, mealybugs and plant-sucking bugs, but we still receive letters from people who have sprayed aphids with arsenate of lead and wonder why they seem to thrive on it. The reason is that the aphids suck the pure sap from the inside of the stems and leaves, while the insoluble poison lies harmlessly on the surface.

In such cases we must use a contact insecticide, such as nicotine or pyrethrum. The poison must actually come into contact with the bodies of the insects, and in order to ensure this, soap or some such wetting agent is used.

In some cases we now apply insecticides in the dry form as a powder—this is called dusting. Dusting is usually much quicker than spraying, but it is less thorough and more wasteful of material.

For dusting, insecticides are specially prepared by grinding to a very fine powder and special blowers or dusting machines are used for applying them.

Poisonous gases are often used against insects and this process is called fumigation. If carried out above ground, the plants or trees to be fumigated must be put in an enclosed space, either by covering them with a tent, as in the case of citrus trees, or by putting them in a fumigation chamber. Insects, such as white grubs in the soil, can be fumigated by injecting the soil with a volatile liquid; for instance, carbon bisulphide or an emulsion thereof.

Apart from the use of insecticides, there are numerous ways of protecting plants from insects, as with sticky bands, tin foil or paper collars, barriers, traps, celophane covers, and many other devices used according to circumstances.

Generally speaking, the cost of the method must be in proportion to the value of the crop to be protected. For field crops, such as wheat, barley and oats, the use of insecticides is usually not an economic proposition. For forest pests, the cost of control must be only a few shillings per acre, but for fruit trees and garden plants a much higher expenditure on insect control is permissible. When it comes to valuable flowers and greenhouse plants, the use of expensive insecticides such as pyrethrum is not only justified but often brings in very handsome profits.

Does Wheat-farming Pay?

SINCE there appeared to be indications that portions of the winter-rainfall area were unsuitable or in any case not particularly suitable for wheat production, the Division of Economics and Markets instituted a comprehensive investigation, during the crop year 1938-39, into farming conditions in the wheat-growing districts of the winter-rainfall area.

The object was not so much to determine which factors determine profits or costs of production, as to compare the profitability of wheat farming as practised in the various areas. The following areas were covered by the survey: (*a*) Swartland; (*b*) Strandveld; (*c*) Rûens; and (*d*) South-western Districts (abbreviated to S.W.D.).

Particulars of this survey are contained in Bulletin No. 227 (Economic Series No. 31) "A Comparative Study of Wheat-Farming in Four Sub-Areas in the Winter-Rainfall Crop Districts of the Union of South Africa—Crop Year 1838-39 ", by Dr. J. C. Neethling, and obtainable from the Division of Economics and Markets at 6d. per copy.

Fire and Veld Management.

Veld-burning as an Agent in the "Ngongoni" Sourveld.

P. J. S. Coetzee, Botanist, College of Agriculture, Cedara, Natal.

NATURAL pastures are an asset of considerable importance, and in spite of the fact that in years to come intensification with improved pastures may take place on an ever-increasing scale in many areas of the Union, the veld will nevertheless always constitute the foundation of most of our farming systems. It is therefore of primary importance that suitable ways and means should be found of managing the natural herbage to the best advantage.

Notwithstanding the fact that fire, as an agent of veld management, has been employed by the European farmer since his arrival in this country, there has always been diversity of opinion as regards the desirability of the practice. This difference of opinion is due mainly to the fact that it is not always clearly recognized that different types of grassveld react in a totally different manner to the same burning treatment. Frequently, too, the effects of the process of burning are not isolated from those of the dual process of burning and grazing.

The Scope of this Article.

Natural grassveld in Natal can be classified for practical purposes into two main types, viz., sweetveld and sourveld. But there are two distinct types of sourveld, viz., "highland sourveld" which occurs at an altitude of 4,500-6,000 ft. and "ngongoni" (*Aristida junciformis*) sourveld. These two types of sourveld differ materially from each other, and all remarks in this article will apply to the latter type only. *Furthermore, on account of the dissimilarity of results obtained in different areas, all remarks in this article apply only to the ngongoni sourveld as typified by the kind of veld found at Cedara.* Many of the underlying principles discussed, however, can be applied equally well elsewhere. The ngongoni sourveld is characterized by a poor soil deficient in phosphate and lime. The summer growth on this type of veld is very luxuriant, but it loses its feeding value during the winter, becoming useless from a nutritional point of view. In the sweetveld, on the other hand, growth commences later and the plants have a higher mineral content. The winter grazing also has a much higher feeding value than in the case of "ngongoni"-veld. Very little natural bush is found in ngongoni sourveld, except on the south eastern slopes, while the presence of numerous acacias is an outstanding feature of some types of sweetveld.

Both types of veld have many species of grass in common, and their respective values from a nutritional point of view are due more to environmental conditions than to the botanical composition of the two types of veld.

Veld-burning Experiments Conducted at Cedara.

As far back as 1921 a series of veld-burning and grazing experiments were commenced at Cedara by Mr. E. Parish, then acting Principal of Cedara, and now one of the two Assistant Directors of the Division of Animal and Crop Production. The various burning and grazing treatments have now been carried out over a period of close on 20 years, and it can be assumed that stability has been attained as far as the effect of any particular treatment on the veld is concerned.

In order to get a better idea of the underlying purpose of these experiments, and also to gain an insight into the interpretation of the results obtained, it is necessary to have some knowledge of the principles governing plant succession as well as of the climate which determines that succession.

Plant Succession in Ngongoni Veld.

Commencing with a bare area, the various stages of plant succession in the ngongoni sourveld can be broadly classified as follows:—

(*a*) *Pioneer grasses.*—These grasses are colonizers of bare ground and consist of both annual and perennial types. The annual types, usually called land grasses, are good fodder plants, while many of the perennials such as, for instance, ngongoni (*Aristida junciformis*), and mtshiki (*Eragrostis plana*) are the reverse.

With the improvement of soil moisture and the general environmental conditions, these pioneer grasses gradually give way to what can be called sub-climax grasses. (A sub-climax arises when the course of succession is halted in a stage preceding a climax as a result of repeated burning.)

(*b*) *Sub-climax grasses.*—These grasses cannot occupy bare ground but only make their appearance after the pioneer grasses have paved the way. They consist of perennial species which are generally considered to be good fodder grasses. Examples of these types are red grass (*Themeda triandra*), of which several strains are found in the sourveld, and "small thatch grass" (*Hyparrhenia* sp.).

If the veld is not burnt or disturbed in any way, the sub-climax grasses in turn will give way to grasses of a taller and coarser type.

(*c*) *Tambookie grasses.*—Tambookie grasses constitute the intermediate stage between sub-climax grasses and bush, where the conditions are naturally suited to bush and forest types. These grasses are very coarse and inferior in feeding value in comparison with red grass. *It is therefore a matter of practical interest to the farmer to decide at what stage the natural plant succession should be arrested so as to get the best value of his veld.*

The sub-climax grasses are the most palatable types and have the best feeding value. It is therefore obvious that in the

management of natural pastures in the ngongoni veld the object should be to maintain the veld in the sub-climax (red grass) stage. If the succession is allowed to progress beyond this stage, coarse unpalatable grasses result. If, on the other hand, the veld is mismanaged in any way, the plant succession will be pushed back to the pioneer stage and such worthless grasses as ngongoni and mtshiki will take complete possession of the soil. This condition has already been brought about on thousands of morgen in Natal.

The Climate of the Ngongoni Area.

The general features of the climate throughout the ngongoni sourveld are those usually associated with a summer rainfall followed by a fairly cold dry winter. The rainy season commences about the

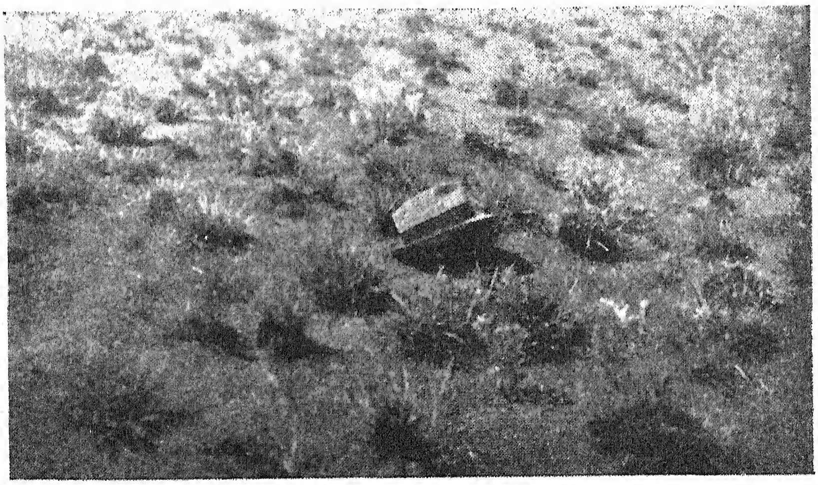


Fig. 1.—Part of control plot, burnt accidentally after 16 years. Note high percentage bare ground.

middle of October and ends about the middle of April, though light spring rains may fall in September or even in August and useful winter showers sometimes occur in May and June.

The summer temperature is never very high and the maximum shade temperature seldom exceeds 95° F. at Cedara. The summer night temperature range between 50° F. and 60° F. During the winter nights, however, the temperature often falls below freezing point, twelve or more degrees of frost being a common occurrence during mid-winter. The experimental area is situated in the mist belt, and the annual rainfall is approximately 36 inches. The monthly maximum, average and minimum rainfall for Cedara is indicated on the graph.

The elevation of the area devoted to experimental work is approximately 3,500 ft. above sea-level.

Results of the Experiments.

Before considering the question of veld burning in some detail it is necessary to sketch briefly the life history of a perennial veld grass. During each successive year the perennials commence growth in spring. This early spring growth takes place entirely at the expense of the reserve food accumulated during the previous growing period. These reserves allow the plants to develop their green foliage, thus enabling them to come into the manufacturing stage which is maintained throughout the active period of growth. When autumn approaches, growth declines and the reserves of plantfood are withdrawn into the roots and stem bases. There they remain till the following spring when the growth cycle commences again.

Experimental results obtained at Cedara can be summarized under the following headings:—

The Effect of Burning during Winter.

A number of ungrazed plots were burned during the dormant period, in May, June, July and August, respectively. Some of these plots were burned annually while others were burned once every two years.

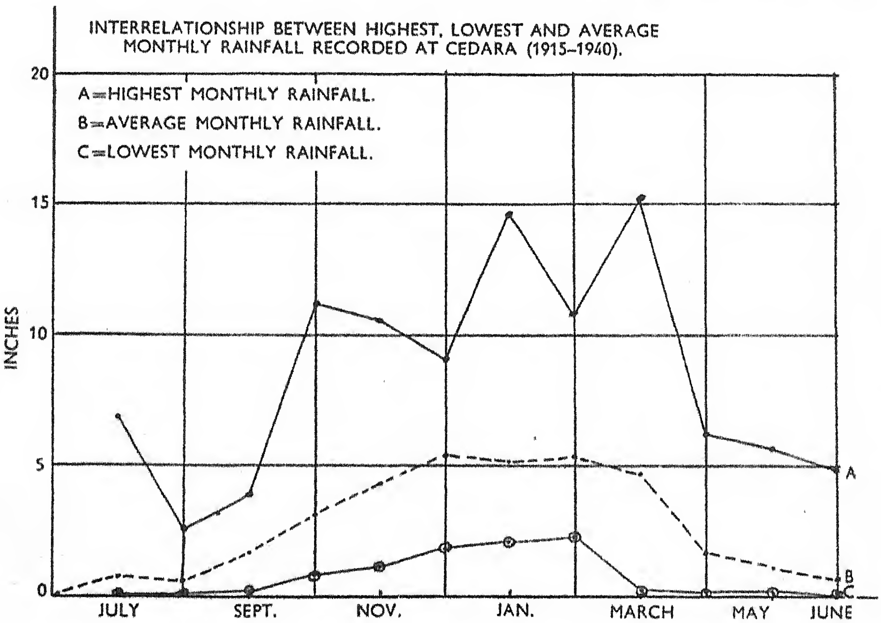
Botanical surveys carried out at the commencement of the experiment and subsequently again in 1929 and 1940 show that there is very little difference between the various plots in this series, as far as vegetational changes are concerned. It was found that burning from May to August encouraged the dominance of red grass, the botanical analysis showing a percentage increase of from 30 per cent. at the initial survey to 78 per cent. in 1929 and to 85 per cent. in 1940. The vegetal cover in all these plots has also thickened considerably. Judging by these results, the most suitable time to burn will be during early spring, immediately after the commencement of the first spring rains. Burning should never be delayed till active growth has commenced. Burning after spring growth has progressed results in severe damage to the veld owing to the fact that the young grass destroyed in this way has been built up entirely at the expense of the reserve food of the plants. If, on the other hand, burning should take place before active growth commences, only the accumulated dry litter is removed and the reserve food of the plant is not affected in any way.

If burning takes place earlier, say during June or July, then the ground is left bare for a considerable period before new growth can take place again in spring. The result is that the soil will dry out more quickly than would have been the case if the veld had not been burnt. Burning during this time of the year may also result in considerable wind erosion as well as in the total removal of all mineral substances derived from the burnt grass.

Burning as soon as possible after the first spring rains has the added advantage that the resultant soil temperature is considerably reduced, thus minimizing the danger of destroying the crowns of the softer and more palatable grasses. From a practical farming point of view, it is not necessary to burn every year. Burning should be done only as often as is consistent with good farming practice,

and in the ngongoni sourveld it is seldom necessary to burn more than once in every two years. The opinion is generally held that the young grass which follows biennial burning is superior in producing ability to the regrowth which follows annual burning, and chemical analysis tends to support this view.

The most important lesson to be learnt from this series of plots is the fact that natural ngongoni sourveld pastures containing a low percentage of red grass can be improved considerably as far as the amount of red grass in the pasture is concerned, by burning during the dormant period. However, this improvement can be brought about only if due allowance is made for reseeding in the grazing



system and if such veld is only very lightly grazed or, better still, left ungrazed for a year or two. In the case of veld which has undergone complete deterioration through the replacement of all the red grass by inferior perennial pioneer grasses nothing can be done. In ngongoni veld attempts at artificial reseeding by hand have so far been a failure.

Winter-Burning Plus Grazing.

The second series of plots were also burnt during the dormant period, but, in addition, were grazed at different intensities, ranging from relatively light grazing—which corresponds to a stocking rate of one beast to two morgen—to much heavier grazing rates. No provision was made for reseeding in this series as grazing was continued throughout the period of active growth.

The results obtained show that grazing of whatever intensity caused red grass to be destroyed and replaced chiefly by ngongoni.

The time taken to accomplish the total destruction of the red grass naturally varied in accordance with the grazing intensity. This destruction of the sub-climax grasses can be ascribed chiefly to selective grazing, red grass being much more palatable than any other veld grass. There is also a possibility that the process of destruction may have been hastened considerably by the tramping of animals, the buds of this species being exposed and thus easily injured.

A botanical analysis carried out recently demonstrated that the plant cover has been reduced considerably, the reduction being roughly proportional to the rate of stocking. Those plots which were grazed heaviest show bare patches. The initial survey of these plots showed that they had a fairly dense cover with a fairly high percentage of red grass.

Burning during the Period of Active Growth.

Under sourveld conditions it is usually not possible to burn annually during mid-summer. The experimental plots set aside for December and January burns could therefore be burned only once in every two or three years, depending on the growth made in the intervening period, and on the general climatic conditions. These plots were not grazed and all changes in vegetation are therefore due to the burning treatment alone. Another series of plots was grazed and burned at the same time as the first series. In both cases similar results were obtained except that in the grazed plots the replacement of red grass by ngongoni and mtshiki was greatly accelerated. Burning during December and January resulted in severe deterioration of the veld as well as in a marked reduction in the density of the cover. It is true that the young leaf growth produced after such a summer burning affords more palatable grazing than would otherwise be obtained, but this temporary advantage is more than offset by the resultant denudation of the soil and the undesirable changes which take place in the vegetation. This system of burning also removes all plant cover at a period when heavy thunderstorms are almost a daily occurence in the sourveld. Considerable erosion can therefore be expected on veld subjected to this punishing treatment.

The rapid deterioration is further hastened and accentuated by the concentrated and severe grazing which usually takes place on such newly burnt areas and thus prevents the cover from re-forming before winter, so that the soil is exposed to the adverse influence of sun and wind. Veld burned in March, i.e. towards the close of the growing season, showed the same replacement of red grass by low-grade pioneer grasses and weeds. In this case, the process of deterioration was more gradual than in the case of the plots burned in December and January. The adverse effect of this treatment can to a certain extent be attributed to the destruction of large quantities of seed.

March-burning is usally done to obtain succulent grazing for sheep, and the fact that such burnt areas are severely grazed well into the winter undoubtedly tends to accelerate deterioration which

is especially rapid if this process is repeated annually on the same piece of veld.

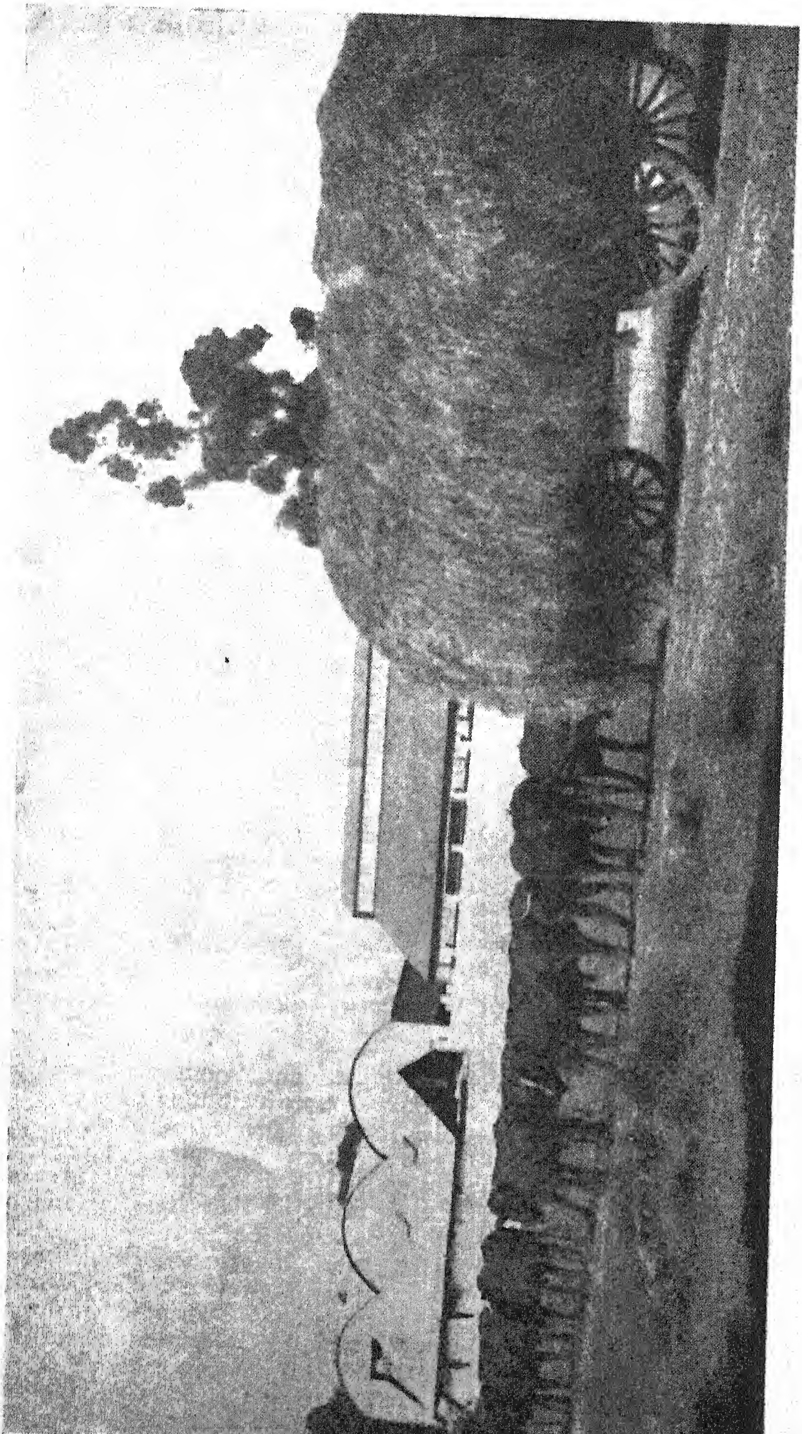
There is little doubt that March-burning in ngongoni veld is sufficiently injurious for the practice to be condemned.

The Effects of not Burning.

If ngongoni veld is neither burned nor grazed, it leads to the formation of a dense mat of dead but undecayed material, which

FIG. 3.—Veldhay can be used for stockfeed and Compost making.

prevents all seeding from penetrating it. The inevitable result is the gradual destruction of the softer and more palatable grasses and their replacement by coarser deep-rooted species, such as the trachypogons and cymbopogons. In this case the plant succession progresses beyond the sub-climax stage, with the result that inferior quality grazing results. It has also been found that after a number of years woody shrubs make their appearance on such undisturbed veld. This fact provides evidence that the climatic and soil climax vegetation in the sourveld is natural forest. However, the succession is prevented from reaching this stage through periodic burning caused by lighting. It is thought that an occasional burning, perhaps once in fifty years, will prevent the plant succession from progressing to forest. A control plot which had been left undisturbed for a period of sixteen years shows the complete disappearance of



Timely Provision.

[Photo: P. J. S. Coetzee.

the sub-climax grasses and their replacement by coarse unpalatable thatch grasses. The ground is covered to a depth of about five inches with a dense mat of undecayed grass. It is significant that the actual number of plants per unit area in this plot decreased greatly in comparison with that in plots which received other treatments, and also in comparison with the original density of the cover of the control plot itself at the commencement of the experiment.

The series of plots which were only grazed and not burned also show accumulations of dry vegetable matter, the amount varying in accordance with the rate of stocking. It is found that even in the case of the most heavily grazed but unburned plots there was a considerable accumulation over a period of years.

Replacement of Burning by Mowing.

Mowing the veld periodically has the advantage that the need for burning is delayed. If proper provision is made for the reseeding of the sub-climax grasses, then mowing may to a certain extent take the place of burning. It has been found, however, that grasses with narrow wiry leaves tend to predominate in veld that is only mown or only mown and grazed but not burned. The question of veld control by means of the mower, in ngongoni veld, deserves further study.

Although these experiments provide no complete solution in so far as the veld-management problems in the ngongoni sourveld are concerned, it can nevertheless be claimed that they throw considerable light on the undesirable changes which may take place when the veld is not treated properly.

Further Experiments Commenced at Cedara.

The harmful effects of grazing veld continuously throughout the summer months is clearly illustrated as well as the desirability of a system of rotational grazing which should make ample provision for the reseeding of the veld. With this object in view a series of additional experiments has been commenced at Cedara, which it is hoped will elucidate some fundamental points which are still obscure.

From the results obtained so far, it is clear that all sound methods of grazing management should be based on the laws governing plant growth. Equilibrium should be established between plant and animal requirements. This can best be done by practising a system of rotational grazing which will allow for the restoration of reserve material in the plants as well as provide the animals with young palatable grass.

As regards the size of camp and the length of grazing periods, the farmer should use his own judgment. It is well to remember, however, that in spring the animals should be moved at short intervals form camp to camp so as to cause the least possible damage to the plants. The best practice would be to delay placing the stock on the young veld until the grass has made appreciable growth and then practise rotative grazing, giving ample time for the depastured herbage to make its regrowth.

Rotational Grazing and Reseeding.

A system of rotational grazing has many advantages over a system of continuous grazing. With rotational grazing the stock is concentrated for a short time on a relatively small area, thus ensuring that all the grasses are eaten to more or less the same extent. Selective grazing and its adverse effect on the grazing quality of the veld is consequently reduced to a minimum. Mowing will to some extent bring about a similar effect, and it may be advisable to use this method in addition to that of rotational grazing during the peak period of growth in the ngongoni sourveld.

It is also clear that from time to time allowance should be made for the reseeding of the veld. When veld is grazed year after year without a sound system of management the softer and more palatable species of grasses are weakened and ultimately die. In ngongoni veld the red grass in particular should be given a chance to produce seed at least once in every four years. During the spring following the rest period, the young seedlings should be given time to develop before grazing is again commenced on such an area. Each succeeding year a different camp can be singled out in this way for regeneration.

The system of deferred grazing which consists in resting the veld from spring until autumn, and then grazing it during winter in order to trample the seed in, cannot be strictly carried out in ngongoni sourveld on account of the very low feeding value of the grass during autumn and winter. In sweetveld areas, however, this grazing system has been put into effect with good results.

In order to manage the veld to the best advantage, suitable water facilities should be provided in each camp. Lack of such facilities may lead to the tramping out of the veld in certain areas, which, in turn, may lead to soil erosion and further deterioration of the veld.

Fertilizing the Veld.

Fertilizing experiments carried out at Cedara on red grass sourveld show that phosphatic dressings do not produce significant increases in yield. They further show that when nitrogen is included in the mixture the response is much better. In general it may be stated that the response is much inferior to that obtained in the case of many established pastures. When we consider that *paspalum dilatatum* gives a much better response and its protein-content is 50 per cent. higher, whilst kikuyu has a protein-content double that of veld, it is evident that the fertilizing of Natal sourveld cannot be regarded as an economic procedure.

Summary of Main Points.

(1) The effect of fire on the vegetation depends, amongst other factors, on the type of grassland, the plant succession within that particular type of veld, the time of burning, the grazing intensity, rainfall, etc.

(2) The beneficial effect of an occasional burning is generally acknowledged. In the ngongoni sourveld burning once every second or third year can be recommended.

 [*Continued on page* 131.

The Structure and Quality of Eggs.

A. M. Gericke, Senior Lecturer in Poultry, Agricultural Research Institute, Pretoria.

FROM an external appearance eggs differ in size, shape, colour and shell texture. Most consumers base the value of eggs on these characteristics, but a number of changes which affect the internal quality may take place within the egg. This is because the egg

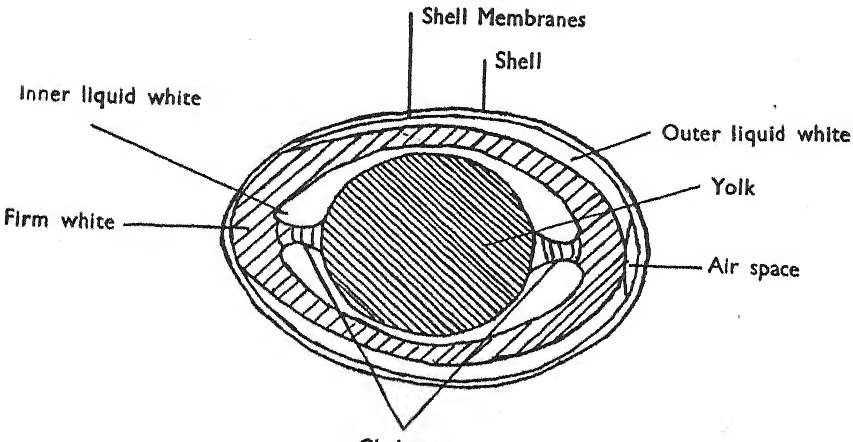


Fig. 1.—Interior arrangement of the hen's egg (Almquist 1933).

is a perishable food product and liable to deteriorate in quality if not properly handled.

Quality is determined by the condition of five primary factors namely the shell, the airspace, the yolk, the white, and the germ.

The Shell of the Egg.

The egg shell consists of three layers, the inside or mamillary layer, the intermediate spongy layer, and the surface cuticle commonly referred to as "bloom". According to Clevish (1913) the intermediate layer consists of calcium-carbonate crystals knitted together and is penetrated by small tube-like passageways. The passageways are closed at the outer ends by the cuticle.

Experiments have indicated that there is a number of factors which influence the thickness of egg shell. Although such factors as lack of vitamin D, diseased conditions of the shell-forming organ and extreme heat or cold may cause considerable variation in shell texture, it is certain that an adequate supply of calcium carbonate should be available to the hen for egg-shell formation.

The most popular supplements of calcium carbonate to poultry rations are oyster shell and limestone flour. For best results, limestone should have a low magnesium content. Wheeler (1919) found a definite shortage of calcium and other minerals in the eggs of fowls and ducks fed rations containing a high percentage of magnesium and a low percentage of calcium. An excess of magnesium has an undesirable effect and prevents calcium from being assimilated for the formation of good quality egg-shells. Egg shell contains approximately 93 to 94 per cent. calcium carbonate. Oyster shell is an excellent source of calcium because it contains as much as 93 to 94 per cent. calcium carbonate.

Halnan (1925) proved that wheat did not supply sufficient calcium for the formation of an egg. He indicated that a hen fed on wheat alone would have to consume nearly 12 pounds to supply sufficient calcium for one egg. Since a laying hen consumes from 3 to 5 oz. of mash and grain per day, the deficiency of wheat is apparent. This illustration shows that the grain and mash ration should be supplemented with adequate mineral constituents.

For instance, the following laying ration is deficient in calcium and phosphorus:—

A laying mash consisting of 44 lb. yellow mealie meal, 10 lb. maize germ meal, 5 lb. wheat bran, 10 lb. oatmeal, 10 lb. lucerne meal, 7 lb. meat meal, 7 lb. peanut meal, and 7 lb. white fish meal, contains 20·48 per cent. protein, 1·3 per cent. calcium and 0·875 per cent. phosphorus. If this mash is fed with an equal quantity of yellow mealies as scratch grain, the total ration contains about 15 per cent. protein, 0·67 per cent. calcium and 0·55 per cent. phosphorus. In this ration the calcium and phosphorus contents are too low for the production of good quality egg shells and for the maintenance of normal growth and health in laying hens. The calcium should be increased to 2 per cent. and the phosphorus to 1 per cent. Thus, by adding 4 per cent. bonemeal and 1 per cent. oyster shell powder to the mash the calcium and phosphorus requirements can be met in the total ration. In addition it is recommended that ½ to 1 per cent. of common salt be included in the mash.

Wilgus and his colleagues (1937) found that rations containing too little manganese or an excess of calcium and phosphorus produce perosis or slipped tendons in chicks, lower egg production and hatchability, and gave poor egg-shell structure. To meet the manganese requirements in the ration, from ¼ to ½ lb. of manganese sulphate should be added to 1 ton of mash.

Eggs of poor shell texture are more common during the hot summer months of November to February than during the cold months of the year. Gericke, van der Spuy and Schmidt (1937) proved that hens with an adequate supply of calcium in the ration will produce eggs of better shell texture during the summer months than hens on a low calcium diet. Bennion and Warren (1933) found that all components of an egg decreased under a high temperature; the shell and albumen decreased considerably more than the yolk in proportion to their weight, which indicates that the oviduct is more

sensitive than the ovaries to high temperatures. In 1940 Warren and Shnepel found that hens and pullets held under controlled air temperatures showed a striking reduction in the thickness of their egg shells when subjected to 90 degrees F. Their results suggest that high humidity tends to accentuate the depressing effects of high temperature on shell thickness. The calcium content of the blood was reduced in about the same proportion as was the shell thickness when the birds were subjected to high temperatures.

There is reason to believe that the variation in egg-shell thickness is an inherited characteristic. Taylor and Lerner (1939) actually bred two lines of hens, one producing thin- and the other thick-shelled eggs. Analysis of the results indicated that heritible factors were involved in the determination of the amount, thickness and percentage of egg shell chacteristic of individual hens. In several matings the dams seem to have relatively more influence in determining the character of shell produced by the daughters than the sires.

Perhaps poultry farmers do not always realize that breakage of eggs means a serious loss to them. The loss is not only dependent on the number of eggs that are broken in transit. If there is a breakage of one or two per cent. on the way to the market, the farmer is paid for a smaller quantity, whilst the contents of a broken egg may also spoil many sound eggs by adhering to the shells and packing material. As soon as the liquid material dries, the sound eggs stick to the packing material and cannot be removed easily at the marketing end. Furthermore, many of the sound eggs stained with egg material are unattractive and do not sell at an enhanced price.

Improvement of Shell Texture.

The following suggestions may help the farmer in the production of eggs with a good shell texture:—

(1) Do not breed from hens consistently laying eggs of poor shell texture.
(2) Select only eggs of good shell quality for incubation.
(3) Supply all hens with a well-balanced laying ration.

The following recommendations are made in order to reduce the breakage of eggs at the poultry plant:—

(1) Provide one nest for every five or six hens.
(2) Place straw, wood shavings or clean grass in the nest.
(3) As far as possible keep dry scratching litter in the house. This will prevent eggs from becoming dirty and less handling will be necessary.
(4) Collect eggs at least twice a day.
(5) Place the nest in a cool part of the house. If the rays of the afternoon sun do not reach the hen when she is sitting, she will be more comfortable and less damage will be done to the eggs.
(6) Collect the eggs in a suitable utensil. Do not take a narrow bucket when collecting a large number of eggs. The weight of the eggs may crack the shell or even break some eggs in the bottom of the bucket.
(7) When cleaning eggs handle them carefully.

Proper Packing of Eggs.

Numerous eggs are broken as a result of bad packing. Before packing it is as well to prepare the box properly. In order to do this adopt the following procedure:—

(1) See that the box is firm.
(2) Place plenty of wood wool in the bottom of the box underneath the first flat.
(3) Do not pack small and large eggs in the same sized cartons. Large eggs packed in small-sized cartons are difficult to remove at the marketing end and some may be broken unless they are handled carefully.
(4) After the box has been packed place sufficient wood-wool on the top flat so that the lid will fit tightly when closed.
(5) The box should be equipped with cleats on both ends to facilitate easy handling.
(6) Fill all cartons. If one tray is missing the eggs will move about in the box and a number may break.
(7) Paraffin boxes are not desirable because as a rule these are not firm enough. The result is that the cartons and flats are not held firmly in position and breakages must occur.
(8) The packing of eggs in sawdust or bran should be discouraged altogether.

Many eggs break as a result of improper conveyance on bad country roads from the homestead to the railway station. When travelling on bad roads it is an excellent idea to place the box of eggs on a bag containing about 6 to 8 inches of grass or straw which will act as a shock absorber, thereby preventing eggs from being jerked about.

In 1937, 22,008 tons of eggs were loaded at railway stations, sidings and halts in the Union and South-West Africa. If the eggs weighed two ounces each, then the above figure represents 352,120,000 eggs. Assuming one per cent. was packed as cracks and leaked out in transit, then 3,521,280 eggs were lost, not including the damage done to sound eggs. This is a serious state of affairs and farmers should assist wherever possible to reduce the wastage occurring as a result of eggs breaking.

Washing.

Washing removes the gelatinous coating of the shell which is a natural protection against infection of the contents and destroys the bloom that is characteristic of freshness.

The practical difficulty is realized that eggs are not always clean when collected. If eggs are washed correctly and handled properly after washing there is little danger that the contents will deteriorate in quality. In fact, Funk (1938) showed that washing did not increase evaporation when eggs were washed in water containing sodium hydroxide. Cleaning the dirty spots with a clean piece of cloth is a far better practice than immersing the eggs in water.

Naturally, washed eggs do not keep as well as do clean eggs. Bryant and Sharp (1934) showed that the main reason for the

deterioration of washed eggs was due to the fact that the eggs were dirty before they were washed and consequently the chance of bacterial infection was greatly increased by washing. Haines (1938) found that if washed eggs are soaked in a bacterial suspension, much more penetration of bactria occurs than with unwashed control eggs.

In the Union definite evidence has been secured that bacteria causing black rot may be present in stagnant pools. Poultry farmers are strongly advised not to wash eggs in water derived from such sources. In such cases it is always best to boil the water and allow

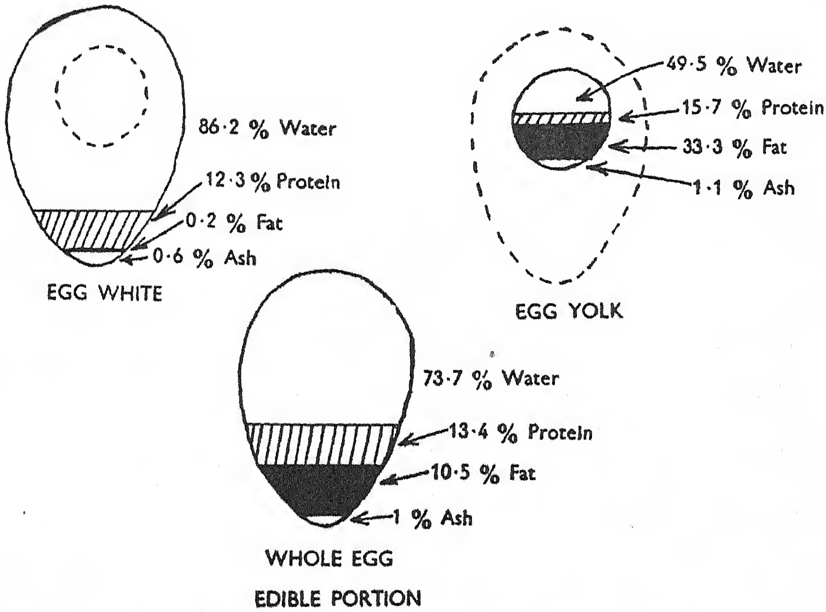


FIG. 2.—Chemical Composition (Langworthy 1917).

it to cool down before washing takes place. There is little doubt that the humidity of the air in which eggs are stored is a very important factor in determining whether dirty or washed eggs show the greatest spoilage.

Shell Porosity.

The shell of an egg is composed mainly of carbonate of lime and is porous, the degree of porosity varying with the thickness and strength of the shell. By porosity is meant those small channels or pores which offer free passage to water vapour, air and carbon dioxide. Porosity of the shell may be variable even in a given individual egg, depending upon the natural characteristics and treatment of the egg.

The work done at the California Experiment Station by Almquist and Holst (1931) shows that egg-shell porosity is fairly uniform for eggs of a particular hen, but differences are noticeable for different

individuals of the laying flock. In fresh eggs porosity is evidently not greater at the air space than at any other part, but this may be expected in older eggs for at the air space the shell is not in contact with watery material but is bounded on both sides by gases. This probably leads to a faster drying of the shell and the pore-filling material and a corresponding faster opening up of the pores in this part of the egg.

Eggs of weak shell texture show greater shrinkage than eggs with low porosity. Under conditions of high porosity the entire egg system may be expected to lose weight after having been in storage for some time.

Poor shell texture is caused by the presence of moisture distributed in a non-uniform manner throughout the shell. Almquist and Holst found that poor shell texture is not a permanent characteristic of the shell, but it may vary considerably in the egg after it has been laid. The transitory nature of shell texture is due to a difference in the relative rates at which water is supplied to the shell by the interior of the egg and at which water evaporates from the shell to the atmosphere as affected by storage, temperature and humidity.

The Air Space.

On candling the egg the air space is noticed at the broad end of the egg. It is formed by the parting of the inner shell membrane from the outer one as a result of the cooling and contraction of the contents of the egg after it has been laid. The space is small in a fresh egg and its outline is firm and distinct.

The size of the air space alone is not necessarily the best index of quality. In judging eggs for quality, size of air space should be considered in relation to the condition of the white and yolk.

Changes in Air Spaces.

The size of the air space will vary under the following conditions:—

(*a*) Poor or good shell texture.
(*b*) The rate of evaporation under different storage conditions.
(*c*) In eggs of different sizes the air space will vary.

Almquist (1933) indicated that commercial candlers grading the same eggs tended strongly to lower their rating of the quality of the egg white as the air space increased in size. Eggs which undergo greater rates of shrinkage, however, are those which are more susceptible to several of the real deteriorative processes. In other words, shrinkage, liquefaction and infection by micro-organisms are often found to be associated, because two of the numerous controlling factors, temperature and shell porosity are common to each process.

Defects of the Air Space.

Sometimes eggs with tremulous air spaces are obtained: On testing the egg a movement is observed of the inner membrane around the air space. This movement indicates that the inner membrane has departed from the outer membrane and has failed to

hold the air space in its normal position. On rotating the egg, broad end up, before the light, the displacement of air produces the appearance of an enlarged air space. Although the true air space is still invisible, its position changes as the egg is moved. The outline of the area within which it is free to move is also clearly defined and any agitation of the egg produces a trembling of the loosened inner membrane which separates the contents from the true air space.

A running air space may cause the total separation of the inner membrae from the outer membrane or the rupture of the inner membrane. Dryden (1934) showed that the presence of a tremulous or running air space does not indicate that the egg has a watery white or is weak. Eggs containing tremulous or running air spaces should not be excluded from the first-quality grade provided that there is no sign of deterioration in other respects.

The Albumen or White.

Attached to the vitelline membrane of the yolk are two dense layers of spiral-shaped albumen called chalazae. The chalazae are prolonged in irregular shape—one layer towards the round and the other towards the pointed end of the egg. Almquist has shown that the yolk is not embedded in a mass of firm white as is popularly supposed, but floats in the inner liquid white. The inner liquid layer, although having about the same total volume as the outer liquid layer, has much greater average depth, because it is contained in a smaller space. The outer ends of the chalazae are usually fastened to the firm white layer. In the egg we therefore have three layers of albumen surrounding the yolk.

(*a*) An inner deep layer of liquid white.
(*b*) A firm central layer of white.
(*c*) An outer layer of liquid white.

On breaking an egg the firm white will not flow readily.

Some commercial eggs may have watery whites because the firm white envelope has allowed the inner liquid white to run out. The envelope holding the firm white of an egg receiving shocks and vibration may be weakened to such an extent that the layers of liquid white may mix readily.

An egg with a watery white, which is sometimes called a weak egg, may be defined as an egg in which the albumen is of a watery nature and not of sufficient viscosity to support the yolk in its natural position. Dryden observed that in many cases it is difficult to identify an egg which is weak or which contains a watery white until such time as the enlarged air space has developed.

Watery whites may be caused by such factors as warmth, vibration, storage or age, excessive porosity and probably also by strain in hens towards the close of a heavy laying period. There is evidence to believe that this characteristic may also be inherited. Almquist and Lorenz (1935) reported that the percentage of firm white in stored eggs was found to have a marked association with that of the fresh eggs from the same hens. Eggs with higher

percentages of firm white showed a lower percentage of liquefaction of the firm white during storage.

By selection and candling eggs before incubation, producers should be able to omit eggs of undesirable quality.

The Yolk of the Egg.

The yolk of a good egg should be dimly visible as a shadow when the egg is turned against a strong light. Rapid and free motion and greater visibility of the yolk are associated with lower quality. Fat and protein are the main constituents of the yolk. If normal, the yolk is firm and has an even colour. When a fresh egg is broken into a saucer the yolk should stand well up.

The water content of the fresh yolk is about 48 per cent. while that of fresh white is normally between 85 to 90 per cent. This difference in concentration of water creates a tendency for water to pass into and dilute the contents of the yolk. The water which diffuses into the yolk produces two effects, both of which are undesirable. To make room for the incoming water the yolk membrane is compelled to stretch and is weakened. A second and more serious effect is the marked increase in the fluid content of the yolk substance.

Yolk Colour.

The yolk is enclosed in a delicate transparent membrane, called the vitelline membrane. The material comprising the body of the yolk is recognized as dark and light yolk running in concentric layers throughout the yolk mass. The pigments or colouring matter of egg yolk may show considerable variation, depending on the feed of the hens, the age of eggs, and storage.

Henderson and Wilcke (1934) found that the time required for the feed to exert the initial visible influence on the colour of the egg yolk is between three to five days, depending upon how soon eggs are laid after feeding begins. Biological tests by Payne and Wilhelm (1933) showed that kaffircorn, oats, and meat scraps contain only small amounts of xanthophyll. Ellis (1933) found that hens on a diet nearly devoid of yellow pigments but with cod-liver oil supplement produced nearly colourless egg yolks. Sherwood (1930) showed that the feeding of cotton-seed meal produces a discoloration of the yolk. Grzimek (1933) found that sprouted grain beetroot, buckwheat, white maize, and rice have no yolk-colouring propensities. Seeds and berries rich in tannic acid may also cause a discoloration of the yolk. When hens are fed on large quantities of rape, egg yolks will vary from pale olive to dull black. Rape yields more sulphur than lucerne, hence the detrimental effect on yolk colour.

The conclusion is reached that xanthophyll or the pigment of egg yolk is derived biologically from the plant pigment in the feed. The feeding of yellow mealies, green lucerne and winter cereals should produce yolks of an attractive rich yellow colour.

Mottled Yolks.

Yolks which are mottled appear to have membranes that are not able to prevent a slow penetration by the egg-white proteins. Ordinarily, yolks absorb only water from the white, but in some cases the egg white as a whole is able to diffuse into the yolk, causing a change in the yolk colour at the area of penetration. That egg white may diffuse into the yolk was proved by Almquist and Lorenz

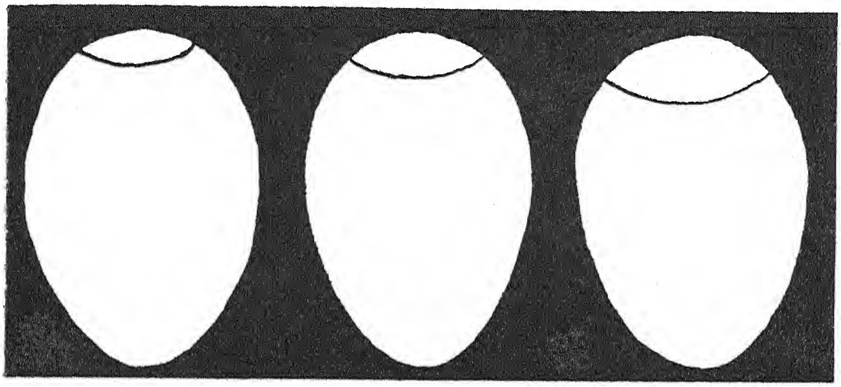


FIG. 3.—Air spaces in commercial grades of eggs. Grade A: $\frac{1}{8}$ inch air space; Grade B: $\frac{1}{4}$ inch air space, and Grade C: over $\frac{1}{4}$ inch air space.

in 1932. This indicates at least one process by which yolks become mottled, apart from feeding hens on feeds producing discoloration of yolks.

Position of the Yolk.

In a discussion of the position of the yolk Almquist (1933) showed that when the yolk is held firmly in the centre of the egg (natural position) very little yolk shadow can be seen by the candler. If the yolk is not held firmly, it may move through the inner liquid white to a position which allows a distinct but not heavy yolk shadow to be seen. Often yolks are not exactly centred in fresh eggs; this causes a distinct shadow on one side of the egg and practically none on the other. It is important to realize that the yolk may have considerable freedom of movement although there may have been no liquefaction of the firm white. Such loose yolks have little or no effect on the appearance of the egg when it is broken out.

Sometimes it is assumed that if the yolk is distinctly visible the white must be watery or is weak. Almquist expressed much doubt on the value of the yolk shadow as a general criterion for the detection of eggs with watery whites. Yolks of about the same size and colour appear to give a more noticeable shadow in smaller eggs or very narrow eggs, probably because of the shorter distance travelled by light from the yolk to the shell.

Perry (1936) found (*a*) that a dark yolk produced by feeding yellow maize and grass, causes a darker yolk shadow than does a light-coloured yolk; (*b*) Yolk colour, as determined after breaking

the egg, influences yolk shadow and yolk movement as determined before the candle—the dark yolks cause a darker shadow and increase the apparent movement; (c) dark yolk shadows are not necessarily indicative of age in the egg.

Stuck Yolks.

These are caused when the yolk moves through the white and becomes attached to the inner shell membrane. On candling it will be noticed that the shadow of the yolk becomes dark and is immovable. If such eggs are handled roughly the vitelline membrane will break and the white and yolk will mix. Sharp and Powell (1929) showed that the difference between the densities of the yolk and the white at ordinary temperatures is sufficient to account for the distinct tendency of the yolk to move through the white, usually upwards. The densities of the yolk and the white become more nearly the same at coldstorage temperatures, hence the yolks in coldstorage eggs have less tendency to rise. The more rapid liquefaction of the firm white and the more rapid diffusion of water into the yolk at ordinary temperatures are changes which assist the rising of the yolk. The rising or falling of the yolk in the egg is coincident with the increasing distinctness of the yolk outline and the flattening of the yolk shadow. Care should be taken not to degrade an egg in which the yolk may be placed in the lower portion of the egg, if the other characteristics of the yolk show every indication of a good quality egg.

The Germ.

The germ should show no visible development in a fresh egg. The development of the germ will commence if fertile eggs are subjected to a temperature of 68° F. Eggs should therefore be stored in a cool room. On most farms infertile eggs are produced as the cocks are not allowed to run with the hens. This is a sound policy and minimizes the risk of eggs becoming unfit for human consumption as a result of germ development.

Secondary Factors.

In addition to the foregoing primary quality factors three secondary factors should be mentioned: Colour of shell, and size and weight of egg.

Colour of Shell.

Whether or not the shade of colour will affect the price per dozen eggs depends upon the market to which the eggs are consigned. Some consumers prefer a white egg and others a brown egg. Brown eggs are popularly believed to be of superior quality compared with white-shelled eggs. However, there is no evidence to show that the colour of the shell has any bearing on the nutritive value.

Size and Weight.

Size.—Uniformity in size also affects market prices because a lot of eggs of uniform size presents a more pleasing appearance. Mixing small and large size eggs certainly detracts from the market value.

Weight.—The food value of a dozen eggs is directly proportional to the weight. In deciding upon prices weight should be an important factor.

The following is a summary of some factors affecting weight and size:—

(1) The decline in egg weight during the summer is due chiefly to a decline in albumen weight accompanied by a small decrease in shell weight (Philpott 1933).

(2) Sexually early maturing pullets lay smaller eggs than late maturing birds (Hays 1930).

(3) Pullets of good body weight, when they commence laying, produce larger eggs than birds of poor body weight. This is typically illustrated in the following table:—

White Leghorn Production for First Laying Year.

Body weight when laying commenced.	No. of birds.	Eggs 2 oz. and above grade.	Eggs $1\frac{3}{4}$ oz. and under grade.	Eggs below $1\frac{3}{4}$ oz.	Av. eggs per bird
3 lb. to 3 lb. 9 oz.	75	193·8	43·12	1·39	238·3
3 lb. 9 oz. to 3 lb. 15 oz.	94	201·45	35·3	1·03	237·8
4 lb. to 4 lb. 8 oz.	94	203·9	17·4	0·94	222·2

(4) Maximum adult egg weight is attained when a bird reaches maximum adult body weight at approximately 10 months of age (Waters 1937).

(5) The increase in egg weight in the second year compared with the average weight of eggs produced during the first year is 7·36 per cent. (Atwood 1928).

(6) There is a gradual decrease in egg size with each successive egg in the clutch and the longer the clutch continues the greater is the decrease from first to last egg (Bennion and Warren 1933). (A clutch refers to the number of eggs laid on successive days until a pause of 1 day or more in duration.)

(7) Green feed and oyster shell as well as an adequate amount of protein in the ration is of great value to increase egg size (Parkhurst 1933).

(8) Egg weight is an inherited characteristic. Dams which lay large eggs tend to produce daughters which also lay large eggs (Funk and Kempster 1934).

Flavour of Eggs.

Good-quality eggs should be free from abnormal flavour or odour. Foreign odours may be absorbed from any strong-smelling material kept near the eggs. As it is impossible to detect flavour or odour before the eggs are consumed, it is very essential that eggs should not be stored near strong-smelling produce. The importance of good flavoured eggs cannot be over-emphasized.

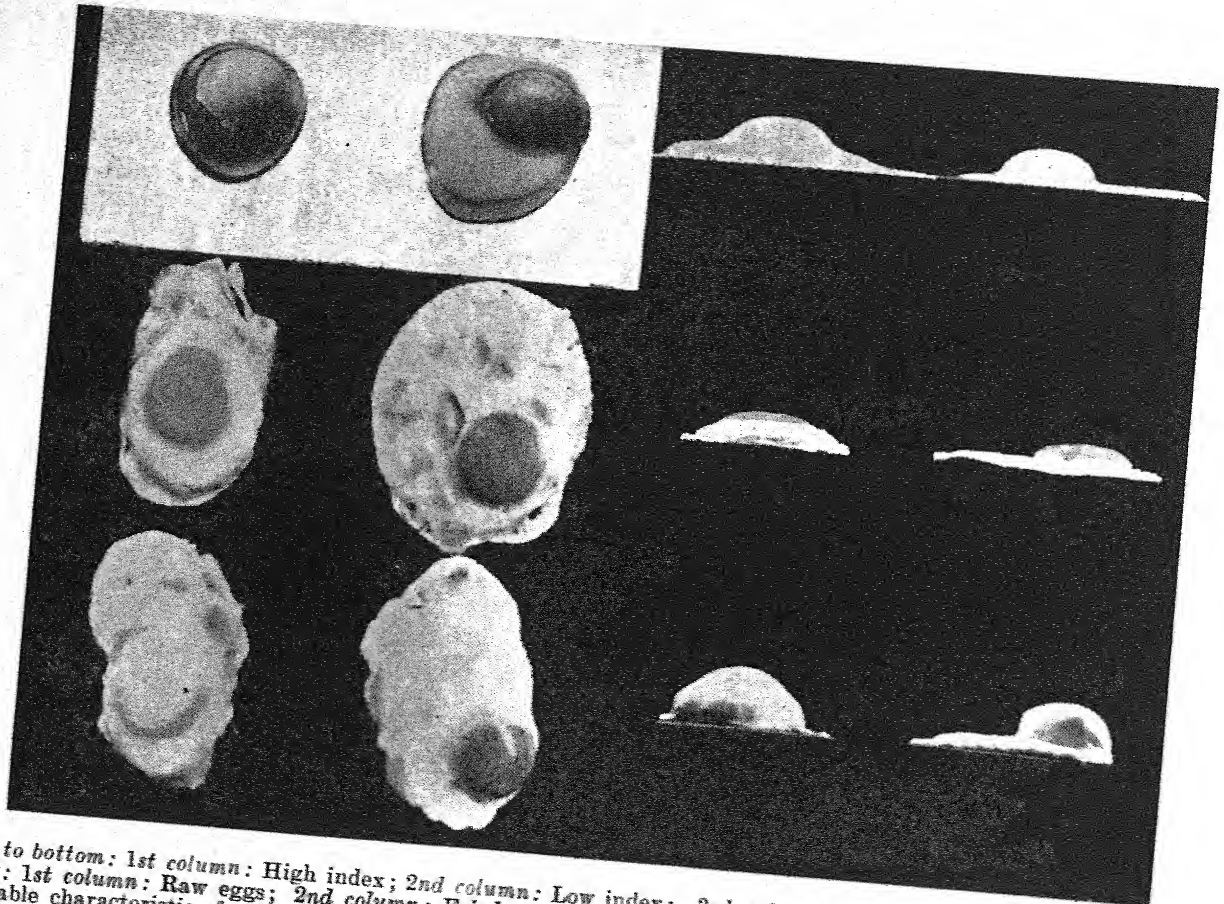


FIG. 4.—*Top to bottom: 1st column:* High index; *2nd column:* Low index; *3rd column:* High index; *4th column:* Low index. *Left to right: 1st column:* Raw eggs; *2nd column:* Fried eggs; *3rd column:* Poached eggs. Certain birds produce eggs which have undesirable characteristics for frying and poaching, despite the fact that their nutritive value may be the same.

[*By permission of Dr. L. A. Wilhelm; U.S. Egg and Poultry Magazine* 43:8:478-479 (1937).]

Producers should realize that certain plants such as rape, turinps, fresh onions and sometimes cabbage will affect the flavour of eggs when fed in large quantities. Eggs stored in musty cellars or rooms with citrus fruit, vegetables, fish or cheese may become so badly flavoured that they are unfit for human consumption.

Common Defects in Fresh Eggs.

Meat spots.—This term refers to solid bodies which are sometimes found floating freely inside the egg. Meat spots are very often unlike meat and may appear in different shapes, forms and colours. Bumester and Card (1938) observed that 71 per cent. of meat spots were located in the thick white of the egg and 81 per cent. showed some sign of red or brown colour.

Blood clots, and diffused blood.—Blood clots are often observed in the white of an egg. It is not certain if blood clots are due to inherited physical defects or to exterior causes such as forced or faulty feeding. This defect is often observed in the first few pullet eggs. The presence of diffused blood in the albumen is probably due to a rupture of a small blood vessel in the oviduct.

Double yolk.—Two yolks may be delivered into the oviduct at the same time and the membranes and shell may enclose both yolks in one operation.

Hatch rings or blood rings.—These are fertile eggs in which germination has started and has reached the stage where a red circle sometimes as large in diameter as a sixpence is seen on the yolk.

Small or Dwarf Eggs.

Pearl and Curtis (1916) stated that an occasional individual of any breed of domestic fowls produces one or more small abnormal eggs. These eggs are called dwarf eggs. Dwarf eggs were classified as yolkless, free-yolked or small-yolked, according to the yolk content. Of the 274 dwarf eggs opened by Pearl and Curtis 35·03 per cent. were yolkless and 64·96 per cent. or nearly two-thirds contained yolks. The yolk was enclosed in membrane in only 9·85 per cent. of the dwarf eggs opened, while free yolk was present in 55·11 per cent. of these eggs.

The production of a dwarf egg is usually an isolated phenomenon occurring only once or twice during the life of a hen. In normal birds the production of dwarf eggs is most likely to occur during the height of the laying season. This phenomenon is not associated with immaturity of the sex organs.

Infected Eggs.

The following three groups of bacterially infected eggs are readily distinguishable in the practical work of egg handling:—

Black rots.—It is probable that many different species of bacteria cause this form of rotten eggs. The prominent feature is the formation of hydrogen-sulphide gas which blackens the contents of the egg.

Sour eggs or white rots.—These eggs have a characteristic sour smell. The contents become watery with the yolk and white mixed.

Spot rot.—In this case the bacterial growth has not contaminated the entire egg but has remained near the point of entrance. Such eggs are readily detected when candled and on breaking show lumpy adhesions on the inside of the shell.

Bushnell and Maurer (1911) observed that the bacterial content of eggs undergoes great seasonal changes, generally increasing with the rise in temperature. Haines (1938) after an examination of several hundred eggs suggests that a high proportion (98 per cent.) of the albumen of fresh eggs and a slightly smaller proportion of the yolks (93 per cent.), are sterile or free from bacteria. The shell of the egg is heavily infected with mixed strains of bacteria capable of producing rotting. A fishy odour is developed during the multiplication of some strains and a strong cabbage-water smell by other forms.

Candling of Eggs.

To determine the quality of eggs, it is necessary to candle them. Candling consists of holding the egg before a strong light, usually artificial, in such a way that the rays of light penetrate the egg, thus enabling one to observe the condition of the air space, yolk, albumen and germ.

Many producers do not candle eggs before despatch to the market. Where a high-class retail trade is catered for, candling is desirable. Consumers do not appreciate buying eggs, some of which may show blood spots, bloody whites or meat spots when broken open.

For candling an electric light or even sunlight may be used. For electric candling a 60 watt inside-frosted bulb should be used. A dull light is inadequate because it does not provide a clear view of the contents of an egg. For home use an electric light and a tin with a moveable top make a cheap easily constructed egg candle. An oval hole 1⅜ inches by 1⅛ inches can be made in the side of the tin. The hole is referred to as an aperture. The lamp should be placed in such a way that the rays of light shining through the aperture do not strike the eyes of the candler when at work. A felt or asbestos pad placed around the aperture minimizes the risk of cracking eggs. The candling lamp should preferably be black on the outside surface.

Better results in candling are secured in a dark chamber. The essential condition is that the work should be done in an even area of shadow.

Candling consists of holding the egg in a slanting position with the large end against the aperture through which the light passes. The egg is grasped by the small end and while held between the thumb and the tips of the first two fingers, it is given one or two quick turns on its long axis. This moves the contents of the egg and throws the yolk nearer the shell, allowing its condition to be carefully observed. The egg must be turned so that all sides are exposed to the candler's view.

The dark colour of the shells of brown eggs makes them more difficult to candle than white eggs. A person candling eggs should be able to distinguish a fresh from a stale egg. In a fresh egg the air space is small in depth. It is considered that an egg with an air space of not more than ¼ inch in depth is a sound egg, provided the yolk and albumen are in good condition. In a fresh egg the yolk is dimly visible, possesses limited freedom of motion and shows no visible germ development. The white is firm and clear and it is free from solid particles, meat spots, or blood spots. Sometimes the chalazae may be visible as a light shadow and it should not be mistaken for solid particles. In a stale egg the air space is large (as a rule more than ¼ inch in depth) and it may have an irregular moveable lower outline. The yolk is plainly visible and moves freely. The white is thin and clear.

The quality of eggs gradually deteriorates from the time they are laid until they are consumed. A careful study by Benjamin (1913) revealed that over one half of this deterioration often occurs on the farm. Eggs were not designed by nature to be marketed as a food product for man; they were designed for natural incubation. They are very delicate in structure and are greatly affected by such conditions as storage, rough handling, changes in temperature and humidity, and lack of cleanliness. It is therefore important that eggs should be handled properly by the producer, salesman and consumer.

Fire and Veld Management— [*Continued from page* 116.

(3) Burning during the dormant period encourages the dominance of red grass and causes the vegetal cover to thicken considerably.

(4) Burning during the period of active growth resulted in the total destruction of red grass and its replacement by ngongoni. The density of cover was also reduced considerably.

(5) Leaving the veld unburnt and ungrazed for any length of time will result in the gradual destruction of the softer and more palatable grasses and their replacement by coarse deep-rooted species.

(6) Continuous grazing throughout the summer months, even lightly, resulted in the destruction of red grass. From time to time provision should be made for the natural reseeding of the veld with red-grass seed.

(7) It is doubtful whether, in the ngongoni sourveld, mowing can take the place of burning. Grasses with narrow wiry leaves tend to predominate in veld that is only mown or only mown and grazed but not burned.

(8) Fertilizing ngongoni sourveld is not an economical proposition.

The Potato Crop.

D. W. McKellar, Lecturer in Field Husbandry, Grootfontein College of Agriculture, Middelburg, Cape.

INTEREST in potato production has increased to a very great extent, and even with the fixed maximum price of this commodity to-day, good profits should be assured, where conditions favour the successful cultivation of this crop.

Although the potato constitutes one of the commonest items in our daily diet it is not generally appreciated that the crop is exacting in its requirements and that fairly intensive cultivation is necessary to obtain optimum returns. To the uninitiated visions of easy profit may be unfolded, but let it be said that there may be many pitfalls before success can be achieved. There are many who are trying this crop for the first time, and where information on any phase of the cultivation of potatoes is required it would be advisable to apply to the nearest College of Agriculture for guidance.

The potato planting season is at hand or in certain localities it may even have passed, but this article applies particularly to those areas where farmers normally plant out-of-season crops, e.g., the coastal areas of the Cape Province, where climatic conditions and market prices permit of the production of autumn or winter sown crops.

Suitable climatic and soil conditions have a marked effect on the ultimate yield that will be obtained from the potato crop, but the quality of the so-called potato seed is a very important factor in relation to the success or failure of the crop. The prospective grower may, therefore, be confronted with numerous problems associated with the seed alone.

Present circumstances are making it increasingly difficult to obtain adequate supplies of imported potato seed, thus rendering it necessary for growers to rely on South African supplies, or to retain their own supplies longer than would otherwise be the case. Local seed in general tends to deteriorate in vigour fairly rapidly, and as a rule it has been customary to retain seed for not more than about four generations from importation, except under favourable conditions. In order to conserve our existing supplies, greater care is called for in respect of seed selection and the choice of seed planted.

Where seed of varying age is procurable, preference should be given to earlier generations after importation. Small seed should not be used, to offset the possibility of transmitting degeneration diseases. Cutting very large seed is sometimes practised with a view to economizing in the amount of seed required, but poor results may be obtained when using cut sets during hot, dry planting weather, unless the cut surfaces are first allowed to dry off for a few days or are dusted with lime, gypsum or wood ash. The use of cut sets, when planting is done in the cooler weather of spring or late summer, is attended with less injurious results. Seed to be planted should

 [Continued on page 136.

Chinkerinchee or Star of Bethlehem Poisoning of Stock.

Dr. Douw G. Steyn and S. J. van der Walt, Onderstepoort.

THERE are various species of *Ornithogalum* (*Ornithogalum lacteum* Jacq., *O. tenellum* Jacq. en *O. thyrsoides* Jacq.) known as chinkerinchee or Star of Bethlehem. They bear white flowers and belong to the lily family. All three varieties are poisonous and have caused serious losses of catttle, sheep and horses in the

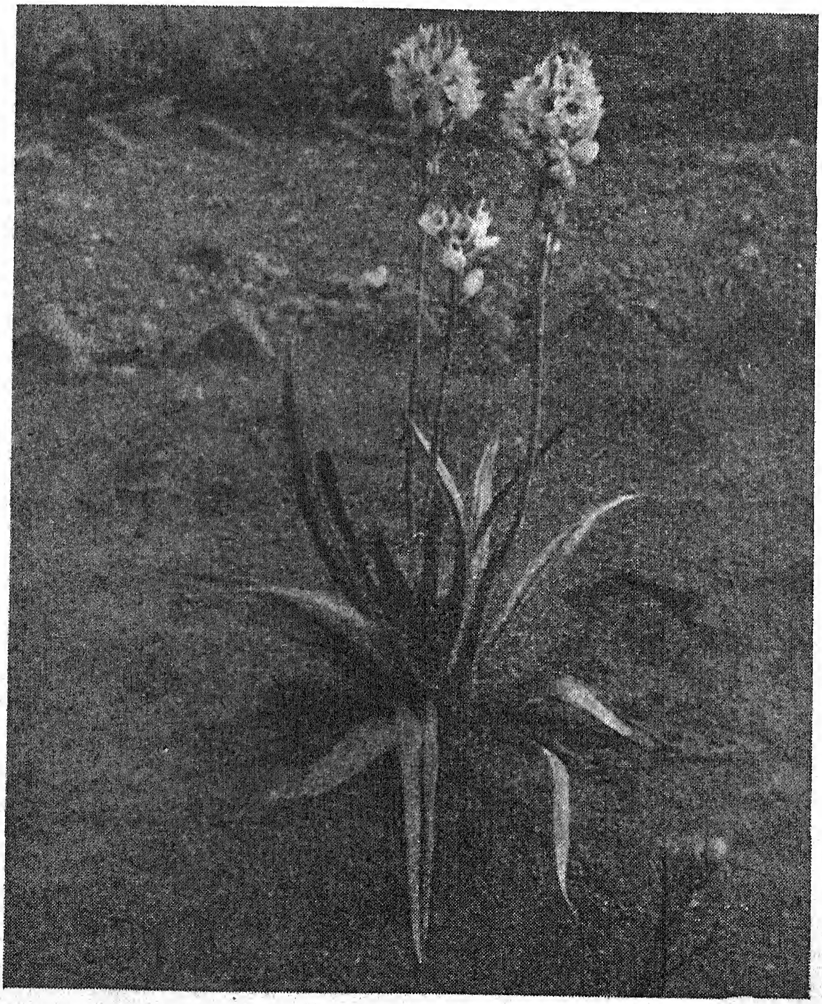


FIG. 1.—*Ornithogalum thyrsoides* Jacq. (approximately $^1/_5$ of the natural size).

past. They occur in the south-western, southern and eastern Cape Province where they are often grown as ornamental plants. The flowers are even sent overseas. Cattle and sheep sometimes eat these plants in the veld, but horses are more fastidious and are generally poisoned only when these plants are present in their hay. Cattle have also been poisoned after eating bulbs discarded by gardeners.

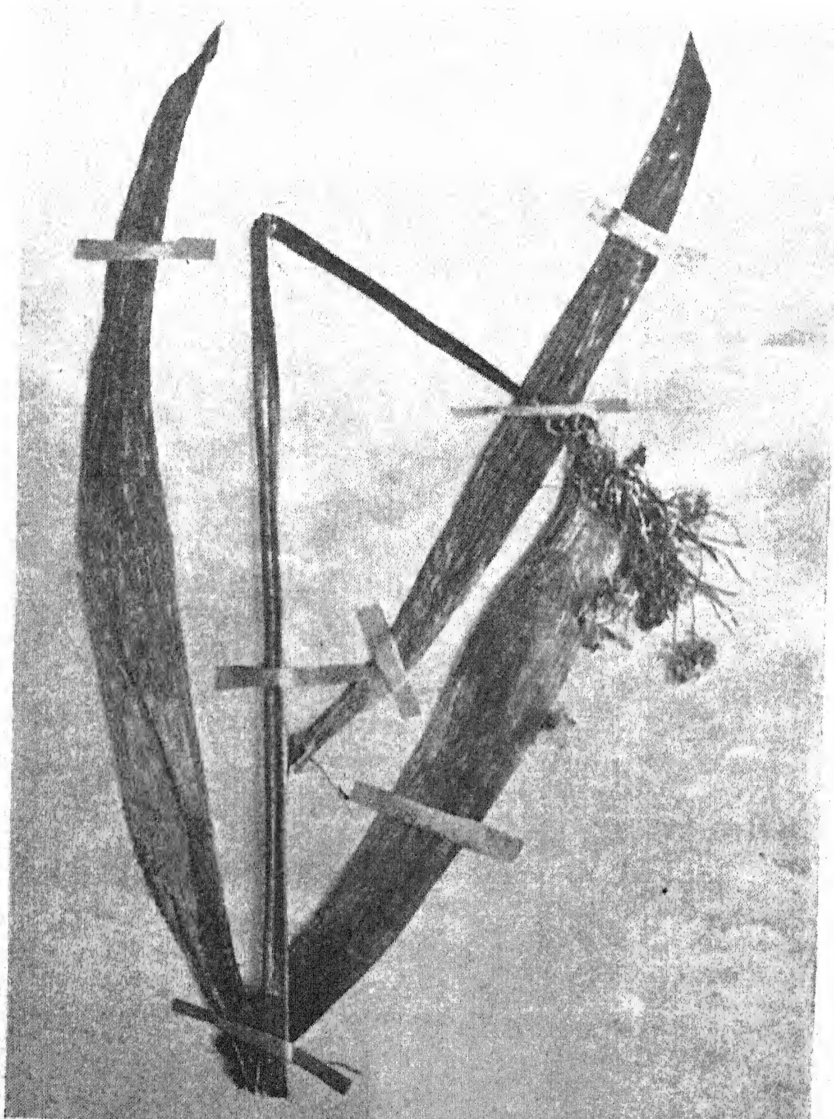


FIG. 2.—*Ornithogalum Saundersiae* Baker.

Mention must also be made here of another poisonous *Ornithogalum* variety (*Ornithogalum Saundersiae* Baker) found in the eastern Cape Province, Natal, Zululand and the eastern and southern Transvaal. The symptoms and post-mortem lesions caused by this plant are similar to those caused by chinkerinchees. This

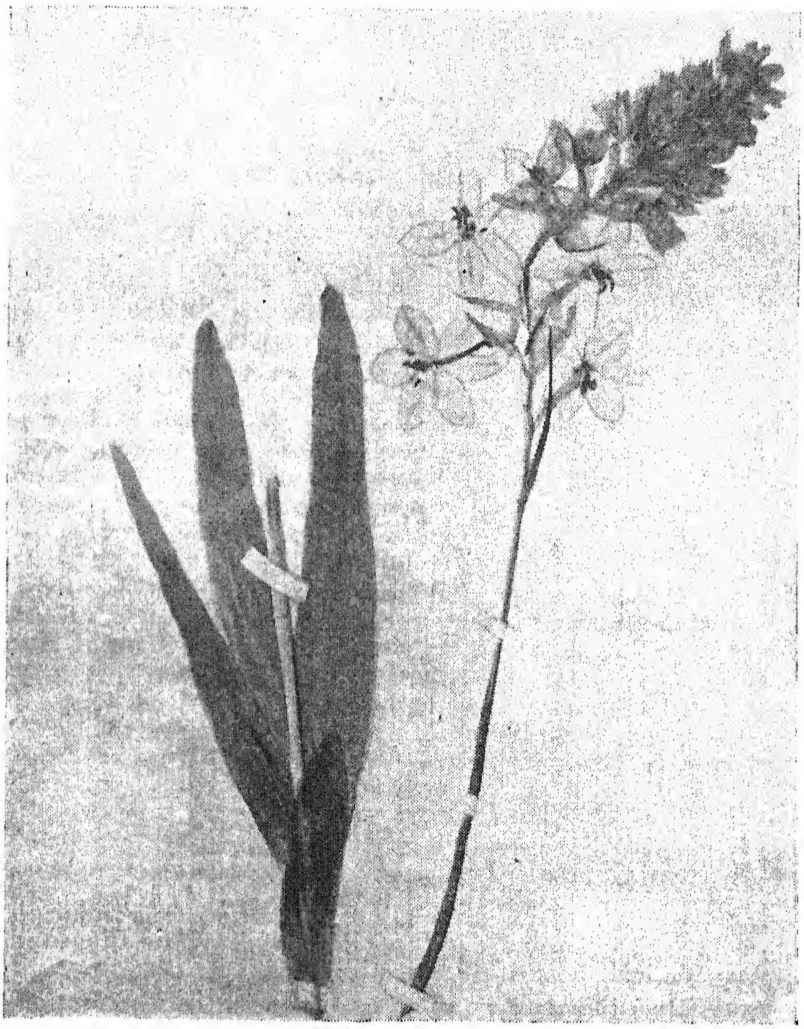


FIG. 3.—*Ornithogalum tenellum* (approximately $^1/_5$ of the natural size).

variety is larger and has broader leaves than the chinkerinchee but otherwise the plants are much alike.

All these plants show a preference for wet marshy places and their toxic principles are unknown.

Symptoms.

Animals poisoned by these plants show the following symptoms: lack of appetite, litslessness, colic, thirstiness, weak and rapid pulse, rapid breathing, severe watery diarrhoea which may also be bloody, general weakness and even inability to stand up, loss of condition and sunken eyes. If large quantities of the plants are eaten, death may ensue very suddenly before any of the above symptoms are perceptible.

Recently Mr. J. Thornburn, Government Veterinary Officer at Grahamstown, reported an outbreak of suspected chinkerinchee poisoning amongst cattle, in which diarrhoea was followed by blindness in the case of a large number of the poisoned animals. Tests carried out with plants (*Ornithogalum thyrsoides* Jacq.) collected on the farm concerned, resulted in actual injury to the internal parts of the eye. In many instances the injury to the retina was so serious as to cause permanent blindness; in such cases the pupil was small and oblong and showed practically no reaction to light. Apart from this, there are usually no further outward signs of eye injury in the case of blinded animals.

Post-mortem Lesions.

As a rule, the stomach (abomasum of ruminants) is usually severely inflamed and the contents of the intestines very watery. A considerable amount of blood is often found in the lungs and liver and the heart often shows signs of heamorrhage.

Treatment.

Affected animals must, if necessary, be given laxatives or astringents and strong black coffee, followed by the treatment prescribed in the article on "Poisonous Plants" (Reprint No. 2[illegible] of 1937). As a preventive measure, the poisonous plants must be eradicated from lands and pastures on which stock graze. (See also reprint No. 28, 1940 on "Occurrence of poisonous plants on and the trampling and burning of pasturage").

The Potato Crop—

[Continued from page 132.

be carefully examined for disease, e.g., rhizoctonia and potato scab, and where these diseases are present, the seed should be dipped in an accepted fungicide a month before planting.

Apart from the question of seed, time and attention spent on the planting, cultivation, ridging, harvesting and storage, etc., will be amply rewarded if weather conditions favour the grower. The humble potato reacts to good treatment, but it is only by a careful study of its requirements that the best results can be obtained. Each of the cultural operations has its own problems, and experiments designed to test these have been carried out. In many cases the farmer cannot afford to experiment, so let the College of Agriculture he is associated with give him the benefit of its experience and advice.

The Management of Pastures.

K. E. W. Penzhorn, Extension Officer, Division of Animal and Crop Production, Pretoria.

FOR a number of years attention has been focussed on the necessity of establishing pastures in certain areas of the Union where the climate and soil are suitable for successful pasture production. Research work has been carried out by Agricultural Institutions and private enterprise, and the Department has encouraged the growing of pastures by establishing hundreds of co-operative demonstrations throughout the higher-rainfall areas of the country.

The results of this work have been most gratifying. In some areas pastures have had revolutionary effects on stock farming, erosion control and the general faith of farmers in the future of farming. In other areas pastures have, in spite of strenuous efforts, not yet passed the grass-garden stage and have even been dropped altogether.

Reasons for Criticism.

The policy of the Department in encouraging the establishment of pastures has been criticized in the Press and from public platforms. It is admitted that in experiments grasses have been planted in certain areas which have not proved to be particularly suitable, but this is in the nature of experiment. Much of the criticism which has been levelled against the pasture policy of the Department has been due to failure on the part of many farmers to appreciate the objects which the Department has in view in encouraging the establishment of pastures and to bad management of pastures.

It must be pointed out that the Department never visualized the ploughing up of thousands of morgen of good virgin veld to be replaced by pastures; nor was it ever intended to convert all the main cropping areas of the Union into pastures.

The Real Object of Pastures.

The reasons why so much propaganda has been made for the establishment of pastures can be summarized as follows:—

(*a*) To assist the farming community in certain of the grassveld areas of the Union to bridge over the dry winter months, when the summer grazing has lost its nutritive value and before spring rains have brought on new grass growth. The late autumn, winter and early spring have always constituted a big problem to the farmer in the sour or semi-sweet grassveld areas. No matter how carefully he managed his veld, he could not always be certain of being able to maintain high-producing stock, and in many areas not even dry stock, through this period without loss. The only way out is the use of the plough and the production of feed reserves. By pastures

replacing a portion of the annual feed crops and by managing these pastures correctly, annual ploughing is largely dispensed with, soil fertility is built up again and cheaper food of good quality is obtained. During summer the pastures are used for providing reserves of food in the form of silage or hay; during autumn they can be used for grazing and during winter and early spring, winter pastures, if the area is suitable, can be grazed.

(*b*) To provide high-quality grazing for high-producing stock in the mistbelt or other areas particularly suited to pastures, where the natural veld is of inferior quality or has deteriorated badly. Pastures in these areas have been a real boon by providing cheap food, especially for dairy cows. The carrying capacity of such farms has been greatly increased. Here pastures provide summer grazing and winter feed reserves.

(*c*) To reduce to a minimum annual ploughing with its potential harmful effects. Even if a pasture lasts only a few years, this is not a disadvantage, for the soil has had a few years' rest from annual cultivation and has benefited by it. By judicious planning of rotative cropping with pastures or strip cropping on sloping lands, the fertility of these lands can be maintained and erosion prevented.

Main Reason for Disappointment.

As to the disappointing experiences of certain farmers with pastures, many reasons could be advanced, but the main reason in those areas suitable to pastures has invariably been found to be faulty management. Pasture-growing is a new development in South Africa and initially a certain measure of mismanagement is inevitable. It is a lamentable fact that only a small number of farmers in South Africa practise veld management worth mentioning. Where so-called management has been practised, it has in most cases been done to further good stock management rather than good veld management. A combination of good veld and stock management is seldom found. Usually the animal factor is the main or only consideration.

In practice very few farmers have the desire or the knowledge to manage veld or pastures in such a way that the pasture is properly considered. There are very few periods of the year when a farmer could not do with a paddock of good pasture for some or other of his animals, with the result that his pasture camp is never without animals grazing on it. Very few pastures can stand up to such grazing.

Principles of Pasture Management.

Fortunately much experience has now been gained from established pastures, so that, where failures have occurred, the mistakes can in most cases be detected and corrected. Below are indicated some of the mistakes commonly made as well as a few general principles of good pasture management.

(1) *Establishment.*—Most of the pasture grasses that have been successful in South Africa are propagated by seed. In comparison with most annual crops pastures have finer seed and therefore require a very fine seedbed and should be rolled after sowing in order to ensure a firm seedbed, without covering the seed too deeply.

(2) *Fertility.*—If yields from pastures are compared with those of annual crops, it is apparent that an enormous amount of fertilizer ingredients and especially nitrogen is removed from the soil. In the case of annual crops the constant cultivation not only aerates the soil, but also makes available supplies of nitrogen in the soil. It is also the practice of many crop farmers to supply annual dressings of phosphatic fertilizers. Pastures are established to last a number of years and it must be clear, therefore, that, in order to produce high yields year after year, the soil must either initially be very fertile or the fertility must be raised before the pastures are established. It must also be clear that on account of the high protoein content of pastures and the impossibility of cultivating them annually to make nitrogen available, nitrogenous fertilizers play a much more important rôle than in the case of annual crops.

When establishing pastures, additional care should be taken in respect of fertility before planting. This can best be done by a heavy appplication of kraal manure as well as a heavy application of a phosphatic fertilizer. The latter is essential on account of the difficulty of incorporating the relatively insoluble phosphatic fertilizers into the soil in existing pastures. Annual dressings of nitrogenous fertilizers should be applied to maintain the pasture in a vigorous growing condition. With the present price of fertilizers this may be uneconomical and rejuvenation by ploughing up every few years may be more practicable.

Lack of fertility has been responsible for many failures of pastures, where the right grasses were chosen. A flush of excellent growth is the common experience during the first year or two, after which the yields diminish annually until the pastures become unprofitable.

(3) *Management.*—In this respect mistakes are very common. One very often hears the expression: " I *murdered* my grass to see how it would stand up.'' One cannot expect to *murder* a pasture and at same time expect it to grow again year after year. It is admitted that the farmer is often faced with the difficult decision as to whether to starve his cattle and give his pastures the rest they require or to overgraze his pastures, and with no reserves of food available, it is difficult to conceive of the pasture being rested while stock are starving.

General Recommendations.

The principles of good pasture management unfortunately clash somewhat with the requirements of the animals. The feeding value of pastures is at its highest when the grass is a few inches high, but by continually keeping pastures so short they will deteriorate rapidly if given no rest.

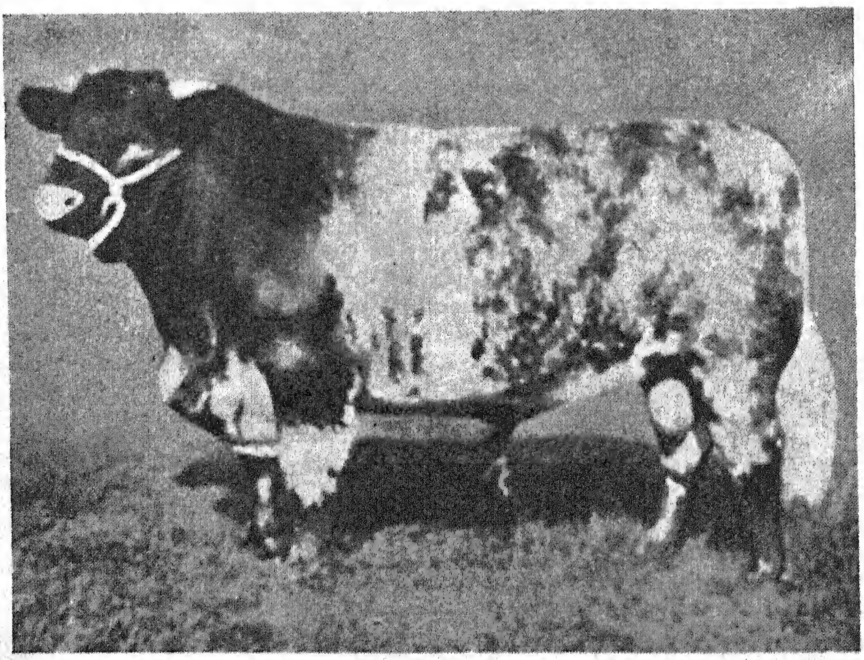
Pastures should therefore be managed in such a way that they provide high-quality grazing when required by high-producing stock,

without, however, keeping them short right through the season. Pastures also need at least one good rest a year in order to allow the grass to grow out. When in this stage it can be cut for silage or hay. This rest should be given either in autumn or spring, depending upon when pastures were grazed heavily during the previous year. For instance, if a pasture was grazed heavily during autumn it should be given a rest the next spring and *vice versa*.

In order to apply the above management, paddocks are essential. The number and size of them will depend on conditions obtaining on the farm, e.g. number and classes of live stock.

It should be pointed out that sheep have already been responsible for the killing of many a useful pasture, especially when the grass is paspalum. Sheep prefer the grass very short, and when sheep graze on a paslpalum pasture continually they ruin it in a very short time. In addition to the short grazing, the trampling effect is harmful. If permanent pastures are required for sheep, management must be very careful indeed.

No hard and fast rules can be laid down for good pasture management. Conditions on farms vary greatly as well as the uses to which pastures are to be put. By following the main principles and applying good common sense, pasture growing can be successfully accomplished in all areas with a sufficiently high rainfall. Wise farmers will find that, after initial disappointments and with experience gained on their own farms, they will never be without sufficient pastures on their farms.



Care of the Cream Separator.

Dr. C. W. Abbott, Lecturer in Dairying, College of Agriculture, Glen.

THE cream separator is a piece of farm equipment which must be selected with care and attended to regularly once it has been installed.

The separator must be capable of separating all the milk within 30 to 60 minutes after milking, otherwise the milk will cool and separation will not be efficient. It must be efficient, that is, it must remove a large percentage of the fat—not more than 0·05 per cent. should remain in the milk. It must be of rugged construction to stand up to the wear and tear of daily use. Ball-bearings reduce the amount of energy required to turn the separator and also prolong its life. A machine in which the gears run in an oil-bath is preferred to one in which the oil drips on to the bearings or in which the latter are lubricated by an oil-can. The cream producer is strongly advised to purchase a separator of well-known and reliable make, as the maufacturers have a reputation to maintain, and spares are readily obtainable.

Mounting the Separator.

A firm mounting must always be provided for the separator. Stand models may be bolted to the floor, and table models to a concrete block. A wooden table or shelf is not a desirable base as it will allow excessive vibration to occur. However, the separator should not be bolted directly on to the floor or concrete block; instead, small wooden blocks about 1 or 2 inches thick should be provided through which the bolts pass. To avoid rotting, these blocks may be painted before the separator is put in place. The frame must stand dead-level. This is usually checked by placing a spirit-level across the part of the frame into which the bowl fits. If the machine is not level, it may be adjusted by putting washers or " shims " of thin metal between the wooden block and the frame. The machine should be tested periodically to ensure that it is still level.

Lubrication and Adjustment.

Lubrication of the gears is all-important. The spindle revolves at a very high speed—often from three to five thousand revolutions a minute—and unless it receives a regular supply of oil, very rapid wearing will result. In the drip-feed or oil-feed systems, oil must be applied daily; where there is an oil-bath, the oil must be " topped off " or filled to the correct level monthly, with a good quality separator oil, not engine oil. If the oil resevoir leaks, more frequent filling may be necessary. Once every three months the oil should be drained off and the gear-case rinsed with paraffin oil. When the paraffin has dried out, fresh oil may be added to the correct level.

If the gear-case holds a large amount of oil, this should not be discarded but may be filtered through blotting paper and used for whetstones, hinges and locks, etc., but it should not be returned to the separator as some of its lubricating quality has been lost.

About once a year, the gears and bearings should be taken apart, thoroughly cleaned with paraffin and dried and replaced; at the same time any worn parts may be replaced. If this is done in winter it will ensure that the machine is in good order for the summer flow of cream. In replacing the spindle be sure that the lowest bearing, if adjustable, is so arranged that the cream and skim-milk openings on the bowl are directly on the level of the respective pans, otherwise mixing of cream and skim-milk, with a resulting loss of butterfat, will occur.

Care should be taken that the bowl always rotates smoothly and without vibration. The least vibration causes mixing of the cream and skim-milk and so increases the amount of butterfat lost. Vibration may result from insecure fastening of the separator to its foundation, from irregular speed of turning, worn spindle or bearings, damaged or worn drum, or from discs which are worn or replaced in incorrect order when numbered.

Cleaning after Use.

After use, the separator should be rinsed by pouring a bucket of lukewarm water (100-120° F.) through it. The parts with which the milk comes in contact should then be taken apart and rinsed in cold or cool water to remove milkiness. The fattiness of the cream is removed by washing in hot water containing an alkali such as washing soda. Scouring soap, abrasive powders or ashes should not be used to polish the metal parts. A brush should be used to reach all crevices and not a rag. Next, all parts are sterilized in steam if this is available; if not, they should be soaked in the hottest water available, preferably boiling water, and set aside to dry in a dust-free place. A rag should not be used for drying. When dry, the parts may be covered with a clean cloth to keep off dust and flies. Before using the separator again, a bucket of hot water should be poured through it while the crank is being turned, to rinse it out and warm up the various parts.

Further Recommendations.

It is important that the crank always be turned at the correct speed. If the separator runs too slowly, excessive amounts of butterfat are lost, and if it runs too fast undue wear and tear result.

Other causes of high butterfat losses are: separating cold milk (the milk should be as near to blood heat as possible), irregular speed of turning the crank, vibration of the bowl, cream and milk outlets on incorrect level, and leakage past the rubber washer.

On a farm where an average of 25 gallons a day is separated, the loss of one half of one per cent. (0·5%) of fat in the separated milk, may not seem very great, but in the course of a year it will amount to 456 lb. of butterfat worth over twenty-six pounds.

The Farm Home.

(A Section devoted mainly to the interests of Farm Women.)

The Preparation and Spinning of Wool.

Miss H. J. A. Olivier, Home Economics Officer, Department of Agriculture and Forestry.

SOUTH AFRICAN women enjoy the privilege of having a raw material at their disposal from which beautiful articles can be made. The rising prices of knitting wool and woollen materials are bringing home the realization that South Africa has wool of good quality from which knitting-wool and wool thread for weaving purposes can be spun.

Many people are under the impression that it is impossible to spin a good wool thread by hand. Although the hand-spun thread cannot be as uniform as the machine-spun thread, with practice a beautiful thread can be spun. The slight unevenness actually imparts a characteristic attractiveness to the thread.

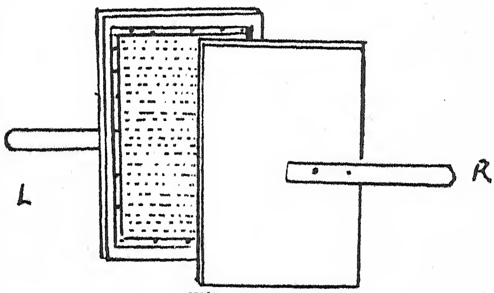


Fig. 1.

Wool is very much stronger and more durable than any other fibre. A proof of the durability of hand-spun and hand-woven articles are the travelling-rugs, which are so popular in the Free State, and many of which have been in use for over 30 years.

The Washing of Wool.

Before being spun, the wool must be washed, teased and carded. Some people recommend that the wool should be spun in its original condition owing to the fact that the natural oils present facilitate spinning. The wool contains a large percentage of sand, however, and consequently it is more advisable first to remove the sand and a portion of the grease.

Soak the wool overnight in lukewarm water, one tablespoon of ammonia being added to every gallon of water. Carefully squeeze out the dirty water; place the wool in a clean bath, cover with an old sheet and pour a warm soap solution over it. The sheet prevents

the wool from matting. Allow to soak for a quarter of an hour, carefully pressing and kneading the wool in the soap solution. Remove the sheet, squeeze out the dirty soap solution and rinse thoroughly in several baths of lukewarm water until all the sand has been removed. At this stage the wool will still be slightly greasy and will, therefore, be suitable for spinning. If, however, the wool is dyed before spinning it must be re-washed in soapy solution until all the fat has been removed, otherwise the colour will not be uniform. Dry the wool in the sun and tease slightly while drying.

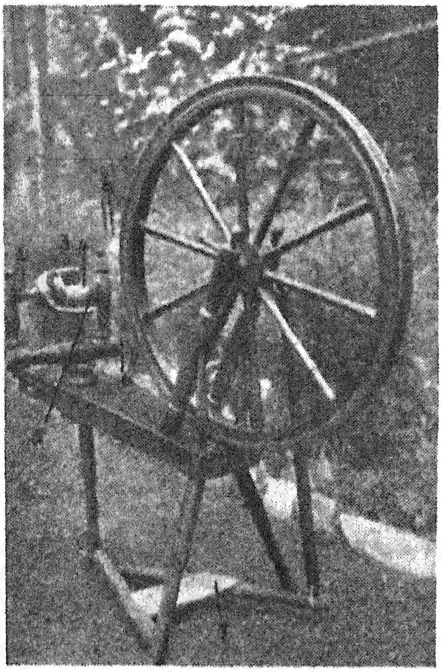


Fig. 2.

The Dyeing of Wool.

The wool may be used white, dyed, or in the natural black or brown colour. Numerous interesting shades of grey and fawn can be obtained by mixing the natural black or brown wool with various quantities of white wool.

Wool may be dyed either in the unspun or in the spun condition, the same method of dyeing being applied to both types. When dyed in the natural condition a more uniform colour is obtained and the dye penetrates the material more effectively.

The dry wool is first weighed and the weight of the dye is calculated accordingly.

Take a large enamel saucepan with sufficient boiling water for the wool to float in. For every 100 ozs. of dry wool, ½ to 3 ozs. of dye (according to the depth of the shade desired) is dissolved in boiling water and 10 ozs. of glauber salts added. Care should be taken to ensure that the ingredients are thoroughly dissolved and mixed.

Rinse the wool in lukewarm water and immerse in the dye. Bring to the boil and boil for 15 minutes. Remove the wool and add 3 ozs. of acetic acid (30 per cent. strength). Stir well and replace the wool. Boil for half an hour. Occasionally press the wool into the liquid, but do not stir.

Remove the wool from the mixture, rinse well in lukewarm water and dry. The wool may also be left in the dye until the liquid is cold. This gives a darker colour.

Tease the loose wool slightly while drying. Skeins of spun wool are shaken well and hung up to dry.

Carding of Wool.

For the carding of wool a pair of wool carders are employed. These consist of rectangular boards, to which pieces of leather with fine wire teeth have been nailed. First tease the wool well and remove steekgrass and seeds. To tease, firmly hold a handful of wool in the left hand and pull out small amounts with the right hand.

Hold one wool carder in the left hand with the teeth facing upwards. Place a small quantity of wool on the carder. Hold the other carder in the right hand with the teeth facing downwards (Fig. 1) and card the wool by lightly drawing the top carder over the lower one about four times. The handles should point in opposite directions as illustrated. Remove the wool from the lower carder by carding in the opposite direction. All the wool is now on the upper carder. Again lightly card four times and then remove wool from the top carder; card again and remove wool from both carders. The wool is now in a small roll, and is rolled lightly along the teeth of one of the carders. The carding of the wool is most important. Since uniform rolls facilitate spinning it is advisable to practice until the rolls are perfect.

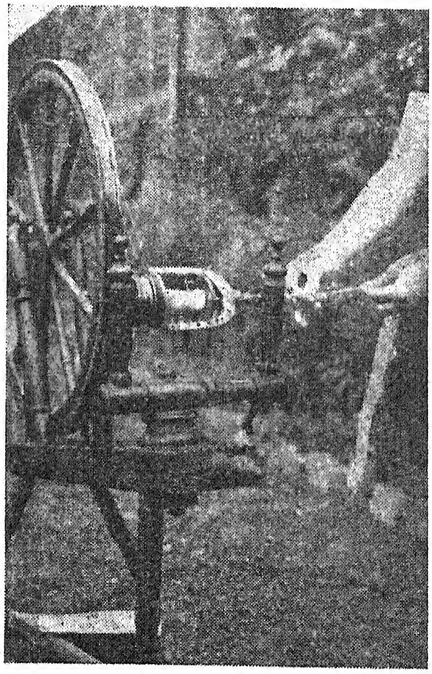


Fig. 3.

The Spinning of Wool and the Spinning Wheel.

By the spinning of wool or other fibre is meant that short lengths of wool or fibre are joined in one long thread of uniform thickness. In the spinning process short lengths of raw material are tightly twisted together. This process is considerably facilitated by the natural crimp of the wool.

The following are the chief parts of a spinning wheel. (See Fig. 3.)

(1) The wheel, which is rotated by the treadle.

(2) The spindle, a metal tube which holds the flyer and the bobbin in position. It is secured to the spindle supports with pieces of leather. The spindle has an eye at one end through which the wool is passed before it is wound round the bobbin.

(3) The flyer, a horseshoe-shaped piece of wood with small hooks along each arm. The hooks regulate the winding of the wool on to the bobbin.

(4) The bobbin, on to which the spun wool is wound. It is essential for the bobbin to revolve smoothly round the spindle so that it may wind the wool as it is being spun.

(5) The bobbin screw or wheel, over which one end of the driving cord passes.

(6) The driving cord, which connects the spindle with the driving wheel. It consists of one piece of tightly twisted string. The cord is fixed round the wheel in the following way. Loosen the tension screw at the front of the spinning wheel so as to move the spindle as close to the wheel as possible. Take a long piece of string, put this round the large wheel, then round the small wheel of the bobbin, then once again round the large wheel and then round the small wheel of the flyer. Tie the two ends of the string securely in a sailor's knot. As the string goes twice round the large wheel, it must cross, care being taken that the point of crossing occurs on the lower section of the cord between the large and the smaller wheels. The tension screw must then be tightened somewhat.

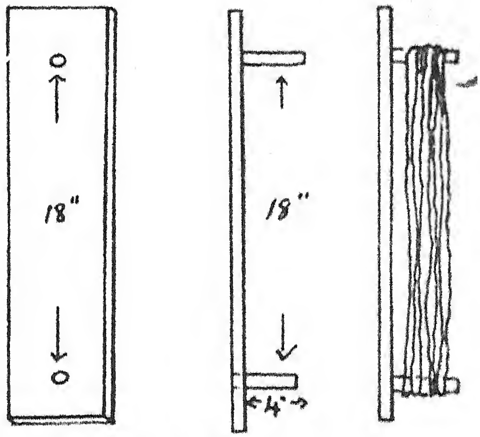


Fig. 4.

(7) The treadle, which sets the wheel in motion.

How to Operate a Spinning Wheel.

It will be found advisable in the first instance to practise treadling. Even treadling is essential for good results in spinning. A slow movement especially should be practised, since a beginner's hands are not sufficiently dexterous to keep pace with a wheel which revolves too rapidly. The wheel should revolve to the right, i.e., clockwise. Once the wheel revolves with a slow and even motion, a start can be made with the spinning. Tie a small piece of spun thread, knitting wool for instance, to the bobbin. Pass the wool over the furthest hook of the one arm of the flyer and then pass it through the other hooks, threading the end through the eyelet of the spindle and out through the small hole at the end. A wire hook is used in threading the wool.

Split the end of the knitting wool. Then take a piece of carded wool, pull it to a point and place this between split ends. Hold the join between the forefinger and thumb of the left hand. Start the

wheel slowly and let the twist thus made on the wool run up the join, which is held lightly between the fingers during the operation. When the join is secure, pull out one or two inches of the carded wool with the left hand to the thickness required and relax the right thumb and forefinger (see Fig. 3). The twist will then run along this wool.

Hold the wool again between the right thumb and forefinger at the end of the twist and draw out more wool from the carded lump with the right hand. Repeat this process slowly, keeping the wheel revolving by means of the treadle. Do not hurry, as the thread will be more likely to break, and do not attempt to get the thread too fine at the beginning.

When these movements have been mastered, try drawing out larger pieces of wool from the carded lump. This makes the spinning quicker and gives a more regular thread.

When one piece of carded wool has been spun, a fresh supply of wool is joined as already described.

With a little practice, the movements of the hands and feet will form a continuous rhythm and it is only in this way that an even thread can be spun.

As one section of the bobbin becomes full, remove the wool from the last hook and hook it round the next. In this way the wool is evenly distributed.

Fast treadling will cause the wool to twist too much with the result that it will become knotted. This will also happen if the driving belt is too slack. The tension screw should then be tightened. The wool is also inclined to knot if held too tightly by the left hand which prevents it from being easily wound on to the bobbin. If, on the other hand, the wool is underspun, i.e., when it is not sufficiently twisted, due to the bobbin revolving too rapidly, the driving belt must be slackened by loosening the tension screw. If the thread breaks, it is joined in the same way as when starting on a new roll.

When two-ply wool is desired, two full bobbins of wool are first spun. Place the bobbins in two separate containers on the floor, pass the ends of both threads through the hole at the end of the spindle, round the hooks, and then tie them round the bobbin of the spinning wheel. Operate the treadle as before; the large wheel, however, must revolve to the left. The two threads are held lightly with the left hand.

When the bobbin is full, the wool is wound into skeins on a skein winder. The wool is wound into skeins since this facilitates washing or dyeing of the wool and the calculation of the amount of wool required. Before removing a skein of wool from the skein winder, it must be tied together in four places to prevent the wool from becoming tangled when it is washed.

For winding the wool into skeins, an effective contrivance can be made with a board and two wooden pegs (Fig. 4). Drive the pegs into the board 18 inches apart; each thread will then be one yard in length.

How to Wash Spun Wool.

The spun wool is washed in order to remove all grease and impurity. Soak the skeins for 20 to 30 minutes in lukewarm soapy water; ammonia may be added if the wool is very greasy. To wash the wool, it must be carefully squeezed in the water. Rinse well and hang up to dry. If the wool is to be dyed in the spun condition, it will now be ready for the dyeing process. If the wool is to be used in the white state it is now ready for use. The wool spun by a beginner is unlikely to be suitable for knitting purposes or dress materials, but will be suitable for floor rugs and possibly for blankets.

The weaving of floor rugs and blankets will be described in a following article.

(*N.B.*—Addresses of firms from whom dyes, wool carders and spinning wheels are obtainable will be furnished by the Department of Agriculture and Forestry on request.)

Crops and Markets

A Statistical and Economic Review of South African Agriculture

by

The Division of Economics and Markets

Volume 20 FEBRUARY, 1942 No. 234

CONTENTS

Agricultural Conditions in the Union during December, 1941.

WINTER-RAINFALL area.—During December the south-western Cape experienced relatively dry, warm weather, with occasional strong winds. As a result the farmers were enabled to thrash practically all their grain. The wheat crop almost normal. The oat and barley crops were excellent. The early fruit crops, especially apricots, were poor. However, the later varieties are more promising, especially grapes, which are excellent. Labour for picking is very scarce in the fruit areas. Vegetables were plentiful. Up till now the harvested fields and dry grazing have been sufficient to keep the stock in excellent condition.

Summer-rainfall area.—In general, conditions had improved somewhat compared with those during the preceding month, but were still below normal for December. Severe drought conditions still prevailed in several areas. Rains fell in the *south-eastern coastal belt*, the *border districts*, the *Transkei* and *East Griqualand*, as well as in *Natal* and in the greater portion of the *Transvaal*. In all these areas the precipitation was still far short of actual requirements. Nevertheless the stock improved somewhat in condition. Ploughing was delayed considerably. The mealies that were planted are promising, but the quantity planted is below normal. Prospects for tobacco in the Transvaal and for chicory in the south-eastern coastal belt appear to be good. The pineapple crop was normal.

The *north-western Cape*, the *Karoo districts*, *Bechuanaland*, *Griqualand West* and the *Orange Free State* have had little or no rain. Severe drought conditions prevailed in the southern and western Orange Free State, in the south-western Transvaal and especially in the Griqualand West and Bechuanaland districts. In the latter two areas extensive cattle losses were suffered. In the Orange Free State the prospects for the mealie crop are generally poor. Ploughing was delayed to such an extent that the area planted is far below normal. In some parts some of the young plants were rapidly drying up. The prospects for the potato-crop are also poor.

During December several additional districts were declared drought-stricken, including a few which had previously been removed from the list. By 9th January 1942 a total of 77 districts were listed as drought-stricken, an increase of 16 over the figure for the preceding month.

The Dairy Position.—As a result of the rains during October and November in the eastern parts of the country the production of butter and cheese increased somewhat during those two months. The production of creamery butter in the Union increased from 1,640,431 lb. in September, to 1,906,214 lb. in October, and 2,691,968 lb. in November. This is still considerably below normal, the production in November 1940 having been 3,912,111 lb., and in November 1939, 4,219,965 lb.

The production of factory cheese increased from 798,624 lb. in September to 911,495 lb. in October, and 1,251,332 lb. in November. During November 1940 the production amounted to 1,344,483 lb. and during November 1939 to 1,584,239 lb.

Owing to the lack of further rains in various dairy areas in the eastern parts of the country and continued drought conditions in the western parts during December, no increase in the production of butter and cheese occurred during that month. For the four weeks ended December 27th, the production of creamery butter amounted to 2,553,558 lb. in comparison with 4,602,954 and 4,925,533 lb. for the corresponding months of 1940 and 1939. The production of factory cheese for the four weeks ended December 27th was 1,036,644 lb.

Price Review for December, 1941.

SLAUGHTER stock.—Prices of *slaughter cattle* on the Johannesburg live-stock markets showed a further increase during December. The average December price for ordinary primes was 68s. 7d. per 100 lb. estimated dressed weight *on the hoof*, compared with 63s. 2d. for the preceding month, and to 44s. 7d. for December 1940. Prices on the Durban market continued to rise up to the last week of the month, but a considerable decline after Christmas brought the average for the month to slightly below the November average. Medium quality cattle, for instance, realized 49s. 2d. per 100 lb. dressed weight on the hook, compared with 51s. 4d. during November, and compounds realized 33s. 6d. compared with 36s. 4d. during the preceding month.

Prices of *sheep* on the Johannesburg market also showed a considerable increase. The average price for prime Merinos increased from 7·4d. per lb. estimated dressed weight in November, to 8·2d.

per lb. during December, and prime cross-breds and Persians from 6·9d. to 7·4d. during the same period. On the Cape Town market prices for sheep remained unchanged.

Mealies experienced slight increases in price, No. 2 white in bags f.o.r., increasing by 2d. to 11s. per bag, and No. 6 yellow by 4d. to 10s. 1d. As a result of the drought prices of kaffircorn again rose fairly high, viz.: K1 from 18s. 11d. per bag f.o.r. in November to 20s. 2d. in December and K2 from 19s. 6d. to 20s. 11d.

Lucerne and teff hay.—The keen demand and the relatively small supplies as a result of the drought caused a further rise in prices. On the Johannesburg market the price of Cape lucerne increased from 4s. 5d. per 100 lb. in November to 5s. 3d. in December, and of teff hay from 3s. 6d. to 4s. 10d. per 100 lb. during the same period.

Potatoes.—As a result of the fixation of a maximum price, combined with large offerings, prices of potatoes declined considerably. National-Mark Grade 1, No. 2 potatoes on the Johannesburg market declined from 34s. 1d. per bag to 22s. 2d. in December, and on the Cape Town market Cape No. 1 potatoes declined from 26s. 10d. to 14s. 9d. per bag. The presence of a large convoy in Durban during the middle of the month prevented the heavy potato supplies from depressing prices to any appreciable extent, so that the average price for the month was just below the fixed maximum, viz., 24s. 8d. compared with 29s. 8d. in November. Owing to the fixation of a maximum price the price differentials between different grades have become much smaller than usual and it is reported that many farmers have simply left off grading as it does not warrant the extra costs.

Eggs.—Eggs were relatively scarce and the exceptionally strong demand caused prices on all the markets to rise. The price of new-laid eggs on the Johannesburg market increased from 1s. 1d. per dozen in November, to 1s. 5d. in December, and on the Durban market from 1s. 4d. per dozen in November to 1s. 9d. in December.

Fruits and vegetables.—According to reports from the branch offices of the Division in the eight principal markets of the Union, supplies of fruits and vegetables were relatively scarce because of the prevailing drought in most parts of the country. Added to this scarcity, the demand in the coastal cities was strengthened considerably by the large numbers of holiday visitors, and in Durban and Cape Town by the presence of large convoys.

Supplies of citrus fruits were declining everywhere except in Durban, and excellent prices were generally realized. In Durban prices tended to decline as a result of large supplies of late oranges from Muden. The average price per pocket for Valencia oranges on the Johannesburg market was 3s. 6d. for December, compared with 2s. 8d. for the preceding month, and for the same months on the Cape Town market 3s. 5d., compared with 2s. 7d. The first shipments of deciduous fruit, consisting mostly of small quantities of peaches and plums and consigned through the Deciduous Fruit Board, reached the different markets towards the end of the month, and realized excellent prices. Fruits, including tropical fruits,

were on the whole exceptionally scarce everywhere. As a consequence watermelons and melons also realized fair prices.

Transvaal tomatoes were plentiful, and average prices declined on the Johannesburg, Pretoria and Durban markets. On the Johannesburg market prices declined from 1s. 11d. per tray in November, to 1s. 8d. in December, and on the Durban market from 1s. 7d. to 1s. 5d. as a result of insufficient offerings; other vegetables realized exceptionally high prices, especially around Christmas. During the last week of December larger supplies reached the markets, the demand slackened somewhat, and consequently prices declined towards a more normal level.

Index of prices of agricultural and pastoral products. In December this index, presented elsewhere in this issue, increased by one point above the figure for the preceding month, and is at present 123 as against 110 in December 1940.

The hay group, i.e., lucerne and teff hay, increased from 110 in November to 135 in December, and the summer grains from 121 to 124. The index for slaughter stock showed a further increase and stood at 147 in December, compared with 140 during the preceding month, and 116 in December 1940. The increase in December occurred in spite of increased supplies of cattle from the Bechuanaland Protectorate and Swaziland, and is due partly to a relative shortage of supplies on the large markets caused by the increased severity of the drought, and partly to an increased demand caused by the December holiday and exceptionally large numbers of visitors in the principal cities. The index for poultry and poultry products increased by 10 points to 128. The increased demand for eggs and table poultry during the Christmas holidays, combined with a relative scarcity, caused an increase in prices.

The Dairy products group showed a higher decline of 7 points for December, viz., from 128 to 121. This was caused by the fixation of prices for butterfat and cheesemilk at a lower level during the summer months, and also by the lower price paid for milk for condensing. The group—other agricultural products— consisting of potatoes, sweet potatoes, onions and dry beans, showed the largest decline during December, viz., 51 points, from 250 to 199. This decline in the group index was caused largely by the fixation of a maximum price for potatoes at the eind of November, which came into full operation during December together with the normal seasonal decline in the price of potatoes during December.

Grain Bags.

ACCORDING to information received, supplies of bags in the country appear to be low, largely owing to the difficulties experienced by importers in obtaining shipping space for bags from Calcutta. For instance, it is stated that orders for delivery in July 1941 arrived only in December. Fortunately, however, there were just about sufficient bags in the country to meet the requirements of the wheat crop.

The limited supply of new bags has created a tendency towards unreasonable increases in the prices of second-hand bags.

Consequently the Price Controller, as was notified in the *Government Gazette* of December 24th, ruled that the prices of second-hand bags may not exceed those of September 1941. This ruling is intended as a temporary measure only until such time as the prices of second-hand bags can be fixed, with possible consideration of the quality thereof.

It may be of interest here to note that the Argentine, according to a recent report, has ordered the expropriation of all second-hand bags at a fixed price. They are to be distributed amongst farmers for the grain crop of the coming season. As an added measure to relieve the shortage of imported bags of Bill was introduced providing for the erection of a factory in the Chaca area for the manufacture of cotton bags.

During the past year the prices of bags again showed a gradual increase. In January 1941 the price of 2½ lb. A Twill grain bags f.o.r. Durban, was 9·3d. per bag, and in December, 11·6d. During the same period the price of wool bags increased from about 3s. 6d. per bag to 4s. 4d. per bag in December.

Inland Marketing of the 1941 Orange Crop.

THE dislocation of the normal citrus exports, due to a shortage of shipping space, necessitated the introduction of a scheme for the orderly marketing, on local markets, of the large quantities of citrus usually exported, in addition to the already heavy supplies on these markets.

In order to facilitate this the Department of Agriculture and Forestry introduced a compulsory grading system for citrus in certain proclaimed areas. These were the municipal areas of Johannesburg, Pretoria, Bloemfontein, Durban, Pietermaritzburg, East London, Port Elizabeth and Cape Town, and for the first time in the history of citrus marketing in South Africa, farmers, using these markets, were compelled to grade and mark their fruit according to certain regulations.

The Citrus Board, having been granted full control of the fruit of their members, instituted a distribution scheme whereby each proclaimed area was to be supplied with a quantity of fruit equal to the average consumption in that area during recent years. These quantities were calculated by the Division of Economics and Markets on the basis of market reports from various branch offices.

The Board assigned certain markets to specific production areas and large packinghouses, and they were responsible for the regular and contiuous supply of these markets.

By this method the daily supply could keep pace with the demand and, at the same time, violent price fluctuations were eliminated. The daily price was a fair indication of the demand, and the supply was regulated accordingly.

Producers who were not members of the Board could send their fruit to any of the above-named markets, provided the fruit complied with the grading requirements.

The proportion of fruit that these growers supplied was not of sufficient importance to affect the stabilization policy of the Board.

Notwithstanding the fact that the Board sold much larger quantities than were marketed in previous years, the average price was much better than in those years.

This can be ascribed to the increased demand in most of the larger centres caused by troop concentrations and the presence of convoys in these areas. However, another very important factor is the fact that the consuming public was assured of a good quality fruit complying in every respect with the sugar and juice requirements laid down in the regulations.

To obtain a clear perspective of the quantities sold in 1941 as against 1940, the figures are given in the table appended below. (For comparative purposes the figures are given from 1 April to 31 December only, and fruit sold in containers other than pockets have been converted to a pocket equivalent):—

	1940.			1941.		
	Pockets.	Pocket equivalent.	Total.	Pockets.	Pocket equivalent.	Total.
Johannesburg.....	864,836	14,778	879,614	798,024	2,486	800,510
Cape Town.......	311,767	329,193	640,960	559,980	108,737	668,717
Durban......	68,449	9,402	77,851	67,647	9,523	77,170
Bloemfontein......	38,790	0	38,790	118,899	0	118,899
East London......	45,104	29,387	74,491	52,353	35,095	87,448
Port Elizabeth....	104,095	50,944	155,039	139,401	10,038	149,439
Pretoria..........	272,349	3,313	275,662	338,096	1,418	339,514
Pietermaritzburg...	105,975	3,501	109,476	122,661	1,532	124,193
TOTAL........	1,811,365	440,518	2,251,883	2,197,061	168,829	2,365,890

In the case of Johannesburg the sales appear to be less than in 1940, but the above figures are for the municipal market only and fairly large quantities were sold through private channels. This was also the case in Durban where the quantities sold on the market are only a very small portion of the total sales in Durban.

The past season was not only satisfactory to the grower who was assured of a fairly stable price, but also to the consumer who previously just bought on chance, but under the new scheme was enabled to purchase fruit of a specific sweetness and juice content at a price which suited both himself and the producer.

The following table reflects the weighed average monthly prices

for Valencias per pocket, on the Johannesburg market, during 1941, with the prices during the three preceding years:—

	1938.	1939.	1940.	1941.
	s. d.	s. d.	s. d.	s. d.
January..	1 10	1 10	1 6	1 9
February.	2 4	1 6	1 11	2 2
March....	2 4	1 4	2 10	2 10
April	1 5	0 10	1 5	1 5
May	—	0 10	1 1	1 4
June	1 0	0 9	1 1	1 3
July	1 2	0 9	1 2	1 3
August	1 2	0 10	1 4	1 7
September..	1 2	1 0	1 5	1 9
October	1 3	1 3	1 2	1 11
November	1 7	1 2	1 6	2 2
December	1 9	1 3	1 9	3 6

The above figures indicate that the average prices in 1941 were higher than in previous years.

These higher prices in spite of the larger supplies, are a clear indication that the public is prepared to pay for a good guaranteed article.

Everything considered it must be admitted that both the grading scheme of the Department and the distribution scheme of the Board were well worth the effort, and, in view of the almost insurmountable difficulties experienced at the beginning of the 1941 season, the outcome of the experiment disproved all criticism.

Fourth Estimate of Expected Wheat Crop: 1941-1942 Season.

ACCORDING to conditions prevailing towards the end of December, based on reports received from crop correspondents, the Division of Economics and Markets estimates that a wheat crop of 4,270,000 bags (of 200 lb.) may be expected this season as compared with the estimate of 4,420,000 bags, made in November. The decrease on the previous month's estimate is attributed mainly to the strenuous drought which prevailed in the Orange Free State during the past three months.

The December estimate in bags for the various areas is as follows (the corresponding figures as estimated in November are shown in brackets):—Cape Province, 2,920,000 (2,930,000); Orange Free State, 800,000 (930,000); Transvaal, 550,000 (560,000); Union, 4,270,000 (4,420,000).

Levy on Dried Fruit.

The levy on dried fruit, payable by dealers who buy from producers, has been increased from 4d. to 5d. per 100 lb. net weight as from the beginning of January, 1942.

Table 1.—Average Prices of Slaughter Cattle and Pigs.

SEASON (1st June to 31st May).	BEEF PER 100 LB.						PIGS PER LB. LIVE WEIGHT		
	(a) Johannesburg.				(b) Durban.		Johannesburg		
	N.M. Prime.	Ordinary. Prime.	Good Medium.	Com-pounds.	Medium.	Com-pound.	Porkers, Prime.	Baconers, Prime.	Stores.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	d.	d.	d.
1938–39........	41 9	39 0	36 3	31 7	33 0	27 4	5·3	6·2	4·9
1940–41........	43 11	41 4	37 11	32 5	31 1	25 4	4·5	5·4	4·0
1940—									
November.....	48 1	45 4	42 0	36 6	34 5	27 6	4·7	5·7	4·3
December......	46 8	44 7	40 2	35 3	31 7	25 9	4·5	5·6	3·9
1941—									
January.......	45 7	42 11	39 6	34 7	32 2	27 7	4·8	5·7	4·0
February......	45 0	41 2	38 1	32 9	29 11	24 5	4·3	6·2	4·1
March.........	40 6	38 3	35 5	29 7	27 11	21 4	4·2	6·1	3·6
April..........	42 4	39 10	36 3	30 1	29 10	25 5	4·2	5·6	3·8
May...........	44 6	40 8	36 10	30 9	29 4	22 1	4·2	5·6	3·9
June..........	43 9	41 2	37 6	32 8	32 2	25 9	4·3	5·4	3·7
July...........	46 5	44 5	39 10	33 5	34 6	29 11	4·6	5·6	4·0
August........	47 0	44 9	41 2	33 7	35 5	29 3	4·5	5·6	3·5
September.....	49 11	47 1	44 2	36 11	41 9	33 11	4·8	5·6	3·7
October........	56 5	53 6	50 1	44 11	46 1	34 8	5·0	5·6	4·2
November.....	68 4	63 2	55 5	42 8	51 4	36 4	5·5	6·2	4·8
December......	72 2	68 7	60 3	43 0	49 2	33 6	5·4	6·4	4·9

(a) Estimated dressed weight of cattle as sold on the hoof.
(b) Dressed weight of carcase sold on the hook.

Table 2.—Average Prices of Sheep per lb. Estimated Dressed Weight.*

SEASON (1st June to 31st May).	JOHANNESBURG.				CAPE TOWN.			
	Merino Wethers.		Persians and Cross Breds.		Merinos.		Capes and Persians	
	Prime.	Medium.	Prime.	Medium.	Prime.	Medium.	Prime.	Medium.
	d.	d.	d.	d.	d.	d.	d.	d.
1938–39..........	6·3	5·5	5·8	5·1	5·8	5·6	5·9	5·7
1940–41..........	6·7	6·1	6·2	5·7	6·1	5·8	6·3	6·0
1940—								
November......	6·9	6·2	6·1	5·5	5·8	5·5	6·3	6·1
December......	7·0	6·5	6·5	6·1	6·1	5·9	6·4	6·1
1941—								
January........	7·0	6·5	6·5	6·0	6·3	6·1	6·4	6·1
February.......	7·1	6·6	6·7	6·2	6·9	6·5	6·8	6·5
March..........	6·7	6·1	6·2	5·7	6·2	5·9	6·2	5·9
April...........	7·0	6·5	6·4	5·9	6·6	6·1	6·4	6·1
May............	7·1	6·5	6·6	6·0	6·0	5·8	6·3	6·0
June...........	7·1	6·6	6·6	6·1	6·3	5·9	6·5	6·2
July............	7·7	7·0	7·2	6·6	7·0	6·7	6·9	6·6
August.........	7·6	7·0	7·1	6·5	7·1	6·7	6·8	6·6
September......	8·2	7·6	7·7	7·0	7·2	6·8	7·2	6·9
October.........	7·4	6·7	7·0	6·3	6·6	6·4	6·8	6·6
November......	7·4	6·8	6·9	6·3	6·8	6·5	6·9	6·6
December.......	8·2	7·4	7·6	6·8	6·8	6·5	6·8	6·5

* As sold on the hoof.

Table 3.—Average Prices of Maize, Kaffir-corn and Dry Beans per 200 lb.

SEASON AND MONTH.	MAIZE. F.o.r. Producers' Stations. No. 2. Bags.	Ex Elevator.	No. 6. Bags.	Ex Elevator.	Cape Town Consumers' Price F.o.r. No. 6 in Bags.	KAFFIRCORN F.o.r. Producers Stations. Bags, K. 1.	Bags, K. 2.	DRY BEANS Johannesburg (Municipal Market). Speckled Sugar.	Cow Peas.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
1938–39.........	8 7	8 6	8 6	8 8	13 2	13 1	12 9	25 0	16 9
1940–41.........	9 2	8 8	9 3	8 9	14 0	15 6	17 0	30 0	16 8
1940—									
November.....	8 10	8 3	8 11	8 5	13 6	—	16 11	35 1	16 0
December......	9 8	8 9	9 9	8 11	14 0	23 6	21 11	35 10	13 10
1941—									
January.......	9 9	8 11	9 9	9 0	14 1	24 3	23 0	35 3	14 11
February......	9 10	9 2	9 10	9 3	14 8	—	23 3	37 0	17 6
March.........	11 2	10 4	11 1	10 5	14 11	—	22 6	34 9	18 10
April..........	10 3	9 8	10 8	10 0	14 11	14 3	15 8	33 2	18 6
May...........	9 1	—	9 4	—	14 4	14 5	14 8	31 0	19 0
June..........	9 2	—	9 0	—	13 8	15 3	15 9	32 6	19 5
July...........	9 3	—	9 1	—	13 7	17 4	17 10	34 8	21 9
August........	9 5	—	8 9	—	13 8	16 9	17 3	35 0	20 8
September.....	10 2	9 3	9 4	8 7	13 9	17 9	18 9	35 6	18 6
October........	10 10	9 11	9 10	8 10	13 11	17 3	18 1	34 6	20 10
November.....	10 10	9 10	9 9	8 10	13 10	18 11	19 6	35 2	19 5
December......	11 0	10 0	10 1	9 1	—	20 2	20 11	32 7	23 5

Seasonal year for maize and kaffircorn, 1st June–31st May; for dry beans, 1st April–31st March.

Table 4.—Average Prices of Lucerne and Teff Hay and Certain Meals for Feeding.

SEASON (1st July–30st June).	LUCERNE (100 lb.). Johannesburg (a). Cape	Trans-vaal	Cape Town, Cape 1st Grade.	TEFF Johannesburg. (a) (100 lb.),	MEALS FOR FEEDING: F.o.r. Johannesburg. Lucerne. (100 lb.).	Monkey Nut Cake (200 lb.).	Oats, Sussex Ground (150 lb.).	Bone, 24·8% Protein (100 lb.).	Mixed, 26·4% Protein (100 lb.). (b)
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
1938–39.........	3 11	3 1	4 0	2 7	6 9	15 2	15 4	8 5	8 0
1940–41.........	4 2	3 5	4 3	3 3	6 7	15 3	14 8	11 2	8 7
1940—									
November.....	4 3	3 10	3 10	4 7	6 6	15 6	15 0	11 0	8 6
December	4 1	3 8	3 11	4 8	6 6	15 6	15 0	11 0	8 6
1941—									
January.......	3 9	3 2	4 0	3 9	6 6	15 0	14 6	11 0	8 6
February......	3 9	2 8	4 1	2 8	6 6	14 6	14 0	11 0	8 6
March.........	3 6	3 0	4 5	2 7	6 6	14 0	14 0	11 0	8 6
April..........	4 0	3 11	5 0	2 10	6 6	14 6	14 0	11 0	8 6
May...........	5 3	3 10	5 0	2 10	6 9	14 6	14 6	11 0	8 6
June..........	5 3	4 9	5 5	3 1	7 0	15 6	15 0	11 0	9 6
July...........	5 2	5 2	5 10	3 10	7 6	15 6	16 0	11 0	9 6
August........	5 6	6 3	5 11	3 3	8 0	—	17 0	11 0	9 6
September.....	6 5	6 1	5 7	3 9	8 6	16 0	17 6	11 0	9 6
October........	5 8	5 6	5 1	3 10	8 6	—	17 6	11 0	9 6
November.....	4 5	3 11	4 11	3 6	8 6	—	—	11 0	9 6
December......	5 3	4 10	—	4 10	7 6	—	17 6	10 6	9 6

(a) Municipal Market. (b) Approximately half of the protein is claimed to be animal protein.

Table 5.—Average Prices of Potatoes and Onions on Municipal Markets.

Season (1st July to 30th June).	Potatoes (150 lb.).						Onions (120 lb.).		
	Johannesburg.				Cape Town.	Durban.	Johannesburg.	Johannesburg.	Cape Town.
	Transvaal. No. 1.	Transvaal No. 2.	N.M. Grade 1. No. 2.	N.M. Grade 1. No. 3.	Cape No. 1.	Natal No. 1.	Transvaal.	Cape.	Cape
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
1938–39	6 9	6 2	8 10	8 1	8 3	8 10	8 3	8 10	7 4
1940–41	14 2	13 4	18 6	18 5	15 7	16 10	12 5	12 3	9 10
1940—									
November	15 11	14 5	18 8	17 10	16 11	19 2	11 4	14 2	9 10
December	15 8	13 5	16 11	16 2	10 10	19 5	9 5	10 1	5 8
1941—									
January	11 4	10 1	12 4	11 7	10 2	14 4	7 3	7 3	4 7
February	8 9	8 2	12 1	11 9	14 2	11 0	6 9	7 4	4 10
March	10 10	10 7	13 9	13 8	13 0	13 6	8 1	8 10	5 4
April	14 8	14 10	19 9	19 0	19 4	17 11	8 11	9 9	7 8
May	15 3	14 4	21 1	20 11	16 9	17 11	9 9	10 3	7 6
June	17 9	17 10	22 10	22 7	18 2	21 4	10 8	13 2	9 5
July	22 9	23 5	28 0	28 5	26 8	27 6	16 1	16 1	12 11
August	18 10	19 10	26 10	27 2	24 8	24 9	13 0	19 0	15 3
September	19 2	20. 1	25 1	24 8	28 0	26 7	17 1	16 9	13 9
October	26 0	24 10	28 8	28 8	33 5	29 8	11 3	17 1	12 11
November	25 0	24 3	34 1	32 11	26 10	29 8	9 1	—	10 1
December	21 5	20 1	22 2	21 11	14 9	24 8	10 3	12 4	8 1

Table 6.—Average Prices of Green Beans, Green Peas and Carrots on Municipal Markets.

Season (1st July to 30th June).	Green Beans (Pocket 20 lb.).			Green Peas (Pocket 20 lb.).			Carrots (Bag). (a)		
	Johannesburg.	Cape Town.	Durban.	Johannesburg.	Cape Town.	Durban.	Johannesburg.	Cape Town.	Durban.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
1938–39	1 8	2 3	2 0	2 4	1 9	1 2	3 8	2 6	6 1
1940–41	1 11	2 9	1 5	2 8	2 4	2 3	5 9	4 11	13 4
1940—									
November	1 11	0 10	1 1	2 4	1 6	2 5	3 7	2 6	2 10
December	1 6	0 9	2 0	2 4	1 2	2 5	3 11	1 9	2 11
1941—									
January	1 5	—	1 3	2 11	2 8	2 9	4 8	2 1	5 5
February	1 9	1 9	1 7	2 9	—	2 6	7 11	3 0	15 1
March	1 6	1 8	1 5	3 7	4 8	2 9	9 2	3 2	13 7
April	1 10	2 5	0 9	2 9	2 8	2 9	8 7	3 8	19 5
May	1 5	2 4	1 5	3 4	3 2	1 10	6 7	5 8	13 9
June	3 0	3 5	2 11	4 6	3 6	2 2	6 4	9 0	13 3
July	6 4	6 0	6 11	6 6	3 9	5 1	8 5	9 9	10 11
August	3 0	3 7	3 10	3 6	3 0	3 8	10 4	11 6	16 8
September	2 9	4 6	3 1	3 4	3 3	2 1	8 10	9 0	12 2
October	2 0	3 9	1 9	2 5	2 0	3 6	6 4	7 1	12 10
November	2 1	3 5	1 5	4 0	2 6	4 3	7 6	7 10	8 8
December	3 1	1 7	2 2	7 2	3 9	4 2	7 6	6 1	12 3

(a) Weights of bags vary, but on the average are approximately as follows:—Johannesburg, 130 lb.; Cape Town, 90 lb.; and Durban, 120 lb.

Table 7.—Index of Prices of Field Crops and Animal Products.

(Basic period 1936-37 to 1938-39 = 100.)

SEASON (1st July to 30th June).	Summer Cereals, (a)	Winter Cereals. (b)	Hay. (c)	Other Field Crops. (d)	Pastoral Products. (e)	Dairy Products. (f)	Slaughter Stock. (g)	Poultry and Poultry Products. (h)	Combined Index.
WEIGHTS.	19	13	2	3	34	6	17	6	100
1936–37	118	86	93	92	120	86	89	98	106
1937–38	98	106	111	117	97	113	106	108	100
1938–39	92	107	95	88	79	103	106	94	93
1939–40	85	106	76	92	114	105	106	87	103
1940–41	104	113	105	159	101	108	110	110	107
1940—									
January	97	108	66	87	120	103	103	82	106
February	94	109	74	75	128	103	104	83	108
March	99	109	73	85	132	103	105	92	112
April	99	109	81	100	139	103	100	115	115
May	104	108	86	104	133	106	103	123	116
June	98	109	92	112	114	110	99	104	106
July	96	109	97	132	102	116	101	100	103
August	97	109	109	149	102	116	103	80	103
September	101	109	113	216	102	116	109	80	107
October	102	108	99	225	99	114	117	83	108
November	106	115	112	168	100	107	117	88	108
December	116	115	109	147	101	107	116	100	110
1941—									
January	116	115	98	121	100	104	115	96	108
February	117	115	92	115	100	104	112	107	108
March	130	115	87	125	100	104	105	125	111
April	121	116	98	167	101	106	108	151	113
May	108	116	125	160	101	109	108	157	112
June	107	116	126	183	101	111	111	150	112
July	108	118	128	241	100	130	118	145	116
August	107	118	132	216	100	130	119	109	113
September	115	118	154	228	100	130	128	108	117
October	120	119	138	268	100	128	135	115	120
November	121	133	110	250	100	128	140	118	122
December	124	133	135	199	100	121	147	128	123

(a) Maize and kaffercorn.
(b) Wheat, oats and rye.
(c) Lucerne and teff hay.
(d) Potatoes, sweet potatoes, onions and dried beans.
(e) Wool, mohair, hides and skins.
(f) Butterfat, cheese milk and condensing milk.
(g) Cattle, sheep and pigs.
(h) Fowls, turkeys and eggs.

Table 8.—Average Prices of Apples, Pears and Grapes on Municipal Markets.

SEASON (1st July to 30th June).	APPLES (Bushel box).						PEARS (Bushel box).		GRAPES (Tray).
	Johannesburg.			Cape Town.			Johannesburg.		Johannesburg.
	O'henimuri.	White Winter Pearmain.	Wemmershoek.	O'henimuri.	White Winter Pearmain.	Wemmershoek.	N.M. No. 1.	Other.	Johannesburg.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
1938–39	7 2	6 0	5 10	7 3	8 0	4 3	6 7	4 2	1 3
1940–41	8 4	7 1	6 4	8 11	10 8	5 7	8 11	6 3	1 8
1940—									
November	11 6	6 9	—	11 7	14 8	—	—	—	—
December	11 8	—	—	—	—	—	—	—	2 5
1941—									
January	—	—	—	8 5	—	—	7 0	5 8	1 7
February	—	—	—	7 11	10 6	4 5	9 0	6 9	1 6
March	6 8	5 11	5 7	6 9	7 3	5 2	9 0	6 2	1 10
April	6 9	6 4	6 1	7 6	7 11	5 7	6 3	6 5	1 11
May	7 5	6 3	6 10	8 3	7 10	5 9	8 1	5 11	2 0
June	8 3	7 8	8 4	9 11	9 10	6 9	—	9 5	1 2
July	8 2	7 2	8 5	11 3	11 4	12 6	10 7	7 5	—
August	8 4	8 1	7 3	11 0	11 0	11 8	—	11 1	—
September	11 8	9 1	8 3	10 9	12 10	—	—	—	—
October	10 8	9 0	6 10	10 6	13 5	—	—	—	—
November	16 0	13 0	—	8 5	13 8	—	—	—	—
December	—	—	—	—	16 5	—	—	5 10	3 8

Table 9.—Average Prices of Oranges and Pawpaws on Municipal Markets.

SEASON (1st April to 31st March).	ORANGES (Pocket).							PAWPAWS (Standard box)	
	Johannesburg.			Cape Town.		Durban.		Johannesburg	
	N.M. Navels.	Other. Navels.	Other. Valencias.	Navels.	Valencias.	Navels.	Valencias.	N.M.	Other
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
1938–39.........	1 10	1 6	1 5	2 0	2 1	—	—	2 0	1 7
1940–41.........	1 9	1 7	1 6	1 11	1 10	2 4	2 1	2 2	1 9
1940—									
November.....	—	1 9	1 6	3 3	1 11	3 1	—	2 4	1 11
December......	—	—	1 9	—	1 9	—	—	2 7	1 9
1941—									
January.......	—	0 11	1 9	—	1 10	—	2 11	2 6	1 6
February......	—	2 2	2 2	—	2 9	—	—	3 7	2 10
March.........	—	2 3	2 10	3 0	2 9	2 9	—	3 5	2 7
April..........	1 9	1 8	1 5	2 6	1 11	2 1	—	2 7	2 1
May...........	1 9	1 5	1 4	1 7	1 0	2 2	—	2 0	1 6
June..........	1 8	1 6	1 3	1 7	—	1 8	—	1 6	1 4
July...........	1 8	1 7	1 3	1 8	—	1 11	1 6	1 5	1 2
August........	2 2	2 2	1 7	1 11	1 6	1 10	1 8	1 11	1 8
September.....	2 4	2 1	1 9	2 4	1 8	2 6	1 8	1 9	1 5
October........	—	1 10	1 11	3 2	1 9	3 5	1 8	2 3	1 10
November.....	—	2 9	2 8	3 1	2 7	—	2 5	3 2	2 6
December......	—	2 9	3 6	—	3 5	—	2 6	3 9	2 7

Table 10.—Average Prices of Eggs on Municipal Markets and Prices of Hides and Skins.

SEASON. (1st July to 30th June).	EGGS.				HIDES (per lb.).		SKINS.		
	Johannesburg.		Cape Town, per 100.	Durban New Laid, per dozen.	Port Elizabeth.		Port Elizabeth.		
	New Laid, per dozen.	Fresh, per dozen.			1st Grade, Sun-dried.	1st Grade, Dry Salted.	Merino. Medium, per lb.	Merino. Combings, per lb.	Glovers, Sound, per lb.
	s. d.	s. d.	s. d.	s. d.	d.	d.	d.	d.	s. d.
1938–39.........	1 0	0 9	7 11	1 1	6·0	5·3	4·1	5·7	2 9
1940–41.........	1 1	0 10	8 3	1 3	5·8	6·0	4·9	7·6	2 10
1940—									
November.....	0 10	0 8	7 2	1 0	6·1	5·9	5·0	7·0	2 7
December......	1 1	0 10	8 2	1 4	6·2	6·2	5·4	7·4	3 0
1941—									
January.......	1 1	0 9	9 3	1 3	5·9	6·3	4·7	7·3	3 1
February......	1 4	1 0	9 2	1 7	5·7	5·9	4·4	8·2	3 1
March.........	1 8	1 3	11 10	1 10	5·4	5·8	5·0	8·9	3 2
April..........	2 1	1 7	13 8	2 6	6·3	6·9	6·2	9·1	3 5
May...........	1 11	1 6	15 8	2 7	6·5	6·8	6·3	8·7	4 0
June..........	1 8	1 5	14 9	2 0	6·5	6·8	6·1	8·6	4 3
July...........	1 6	1 4	14 0	1 10	6·3	6·8	4·3	7·8	4 2
August........	1 0	0 11	8 9	1 1	6·5	6·6	4·4	8·0	4 2
September.....	1 0	0 11	8 5	1 1	6·5	6·8	4·4	8·1	4 1
October........	1 0	0 11	8 10	1 2	6·8	7·0	3·8	7·7	4 0
November.....	1 1	1 0	9 1	1 4	7·0	7·1	4·3	7·7	4 1
December......	1 5	1 2	9 10	1 9	7·3	7·3	4·0	7·8	4 2

CONTENTS.

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Information on Departmental Publications.

Farming in South Africa, the monthly journal of the Department, contains popular as well as scientific articles on a variety of agricultural topics, useful to both the farmer and the housewife, while the **Crops and Markets** Section, supplies information on crop prospects, market prices and exports of agricultural produce.

The following particulars in regard to subscriptions and advertisements should be noted:—

Subscription.—Within the Union, South West Africa, Bechuanaland Protectorate, Southern Rhodesia, Swaziland, Basutoland, Mocambique, Angola, Belgian Congo, and British Territories in Africa 5s. (otherwise 7s. 6d.) per annum, post free, payable in advance

Applications, with subscriptions, to be sent to the Government Printer, Koch Street, Pretoria.

Advertisements.—*The Tariff for Classified Advertisements is:* 2d. (two pence) a word with a minimum of 5s. per advertisement (prepaid). Repeats, not entailing any change in the wording, will be published at half the cost of the original.

Conditions:—

(1) The advertisement will be classified under specific headings, and only one black letter (initial letter) is permitted.

(2) Advertisements in which prices are mentioned must contain the name and address of the advertiser. A nom-de-plume or box number only is not sufficient, and unless this condition is strictly observed advertisements will not be accepted.

(3) Advertisements will be classified strictly in accordance with the subject-matter of the announcement, determined by the first item mentioned, and cannot be inserted under irrelevant headings.

(4) Displayed, classified advertisements will also be accepted. The charge however, will be 15s. per inch, single column, per insertion, without reduction for repeats.

Copy for Advertisements to be in the hands of the Government Printer, Pretoria, not later than the 20th of the month preceding publication.
Send all advertisements direct to the Government Printer, or write to him for details as to tariff for advertisements.

Popular Bulletins.—Bulletins on various agricultural topics are published by the Department to meet public demand. A list of available bulletins giving particulars of cost, etc., is obtainable free of charge from the Editor, Department of Agriculture and Forestry, Pretoria.

Scientific Publications.—From time to time the different Divisions of the Department issue science bulletins incorporating the results of research work conducted by them. Other scientific publications issued are: "The Onderstepoort Journal", "Memoirs of the Botanical Survey of South Africa", "Bothalia", "Entomological Memoirs" and the "Annual Reports of the Low Temperature Research Institute". Information in regard to these publications is obtainable from the Editor, Department of Agriculture and Forestry, Pretoria.

Weekly Press Service.—The Press of South Africa is supplied weekly with a bulletin of agricultural information for their exclusive use. This information is published weekly by all newspapers and other journals throughout the country.

Farmer's Radio Service.—In addition to the printed information supplied by the Department to members of the farming community, the Department, in collaboration with the South African Broadcasting Corporation, also maintains a daily broadcasting service to farmers. Information in regard to times of broadcasting is contained in the programmes issued by the Broadcasting Corporation.

Inquiries.—All general inquiries in regard to the publications of the Department, including the Radio Service, should be addressed to the Editor, Department of Agriculture and Forestry, Pretoria.

D. J. SEYMORE, Editor

Short Courses in Agriculture, 1942.

1. Stellenbosch-Elsenburg College of Agriculture of the University of Stellenbosch:

   (*a*) *At Elsenburg.*

   Poultry-farming: 29 June to 3 July.

   Dairy-cattle Farming, Dairying, and Pig-farming: 29 June to 3 July.

   Dairying: 29 June to 3 July.

   Grain and Sheep-farming (including Fat Lambs): 7 to 11 September.

   Fees (board and lodging included): £1. 10s. for each course.

   (*b*) *At Stellenbosch.*

   Home Economics: 29 June to 3 July.

   Fruit Culture and Viticulture: 29 June to 3 July.

   Grain Grading: 29 June to 3 July.

   Fees (without board and lodging): 5s. for each course.

2. Potchefstroom College of Agriculture, Transvaal:

   Three Weeks' Special Courses in Grain Grading: 20 April to 8 May and 6 to 24 July.

   Fees: £4. 10s. per course.

3. Glen College of Agriculture, O.F.S.:

   Three Weeks' Special Course in Grain Grading: 4 to 22 May.

   Fee: £4. 10s.

   Four Weeks' Special Course in Milk-testing and Cheese-making (Theory) for Experienced Cheese-makers: 15 June to 10 July.

   Fee: £6.

   Four Weeks' Special Course in Milk- and Cream-testing: From 20 October.

   Fee: £6.

Full particulars are obtainable from the respective Principals.

HORSE IMPROVEMENT

Stallions will stand at stud at the following Government Institutions during the breeding season, 1941-1942:—

1. College of Agriculture, Middelburg, Cape: Percheron.
2. College of Agriculture, Potchefstroom, Tvl.: Percheron, Thoroughbred and Donkey Jack.
3. College of Agriculture, Glen, O.F.S.: Percheron, Thoroughbred and Donkey Jack.
4. College of Agriculture, Cedara, Natal: Percheron.
5. Stellenbosch-Elsenburg College of Agriculture of the University of Stellenbosch, Stellenbosch, C.P.: Percheron.
6. Veterinary Research Station, Ermelo: Percheron and Thoroughbred.

All service fees are £1. 1s. per service.

Maintenance and grazing fees are 2s. 6d. per week, but an additional fee of 1s. per day is charged when supplementary feeding is found necessary or when such feeding is especially requested by mare owners.

As a veterinary examination is necessary before mares are sent for service, farmers who desire to make use of the facility, should act at once, as only a limited number of mares can be accommodated at one time at institutions.

The South African Railways allow a rebate on all mares sent for service.

Further particulars of the horse improvement scheme are obtainable on application to the institution to which it is desired to send mares for service.

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FARMING IN SOUTH ...AFRICA

Vol. 17 MARCH, 1942 No. 192

Editorial:

The Fertilizer Position.

For some considerable time now there have been in existence two Government Committees whose main task is to watch the fertilizer position carefully. The one Committee has as one of its main functions the duty to offer all possible assistance in the matter of the importation of our essential fertilizer requirements, whilst the second Committee devotes particular attention to the development of new supplies of fertilizer in the Union. As an illustration of the latter activity, it may be mentioned that efforts are again being made to utilize our large deposits of phosphate rock, which, in view of certain practical requirements, must be regarded as inferior. Similarly, the possibility of utilizing the potash in the scour liquid of wool washeries and thus relieving to some extent the potash shortage, is being investigated.

Under present conditions it will not always be possible for the fertilizer merchant to execute orders fully. At the moment, for example, the state of affairs is such that a measure of rationing has become imperative. It is hoped that towards the end of the year the capacity of our superphosphate factories will again allow normal requirements of superphosphate to be met in full, provided there is no restriction of the importation of raw rock, which is now obtained from the west coast of Egypt. As regards nitrogenous fertilizers, it seems possible that through increased importation of such materials as Chili Saltpetre (nitrate of soda) from Southern America and fishmeal from Portuguese West Africa and through the expansion of the bird guano industry on our west coast, the limited supplies of ammonium sulphate, which are still procurable from the United States and Britain, may be augmented to such an extent that the shortage of nitrogen will not become too serious.

In this connexion farmers must once more be reminded of the fact that the nitrogen requirements of their crops can be largely met by including a leguminous crop in the rotation, by green-manuring, and by using compost or various types of farm manure. Frequently, also, crops which do not show a pronounced nitrogen requirement (e.g. mealies) may be grown with safety without any application of nitrogenous substance at all. Whereas in the past many farmers have been in the habit of applying ammonium sulphate as a top-dressing to their established pastures, wheat crops, etc., it must now be pointed out that at present supplies of ammonium sulphate are

very short and are largely reserved by the trade for their mixtures. As a fair amount of Chili Saltpetre has recently been landed and as this fertilizer is less suitable than the sulphate for incorporation in mixtures, though an equally useful plantfood material, farmers are advised to use this in future instead of the sulphate.

The prospects that our minimum requirements of potassic fertilizers will always be procurable are extremely poor as most of the world's requirements came from the potash mines of Germany and France. For this reason the Department desires to draw attention to the fact that our soils are usually fairly well supplied with potash, so that on most of our soils most of our ordinary farm crops can be grown successfully for several years, as an emergency measure, without applying any potassic fertilizer at all. On the other hand, certain crops, such as tobacco and root vegetables and frequently also potatoes, fruit, sugarcane, etc., show such a marked need for potash that it is not generally advisable to grow them without the addition of a potassic fertilizer to the soil, particularly if it is not possible to give a liberal application of animal manure. A special problem is presented by light tobacco of good quality, which has a distinct preference for potash in the form of sulphate. Unfortunately stocks of potassium sulphate are already very low, so that, in spite of the advice now being given to manufacturers of mixtures to reserve their sulphate of potash for tobacco as far as possible, it will not be possible to supply the tobacco farmer with mixtures containing the potash entirely in the sulphate form. Under certain conditions, especially on light sandy soils under irrigation, the potash may be applied in the form of tobacco ash, kraal ash, groundnut-hull ash or Karroo manure, thoroughly mixed with superphosphate to counteract the alkaline reaction. Prior to using this, however, the advice of the Tobacco Research Station or other authority concerned should be obtained, as the use of such materials is not without danger. This warning to consult a competent institution or official *prior* to taking action is one that applies generally where the buying of new mixtures is contemplated or unknown fertilizers are being used for the first time. In this way the farmer will frequently save money and be spared regret.

Finally, it is desired to draw attention to an article elsewhere in this issue on the new fertilizer mixtures which, as from April next, will replace all existing mixtures now on the market. There are many instances where farmers are well advised to use single fertilizers, but there are also many cases where the use of compound fertilizers may be very useful and convenient. By limiting the number of mixtures there will be far less confusion in future and the farmer will have a better chance of getting a mixture that is suited to his conditions and therefore good value for his money.

(Dr. J. P. van Zyl, Chief, Division of Chemical Services.)

Position of the Sheep and Wool Industry in the Orange Free State.

J. C. de Klerk, Sheep and Wool Officer, College of Agriculture, Glen.

SOMETHING seems to be amiss with the merino sheep and wool industry in the Orange Free State. This assertion is made on the grounds of personal knowledge of conditions in this province during the past few years. It is deplorable, for instance, to see almost daily how flocks of merino ewes are run with Persian or Afrikander rams or rams of mixed breed. In addition, the College of Agriculture annually receives hundreds of letters from farmers in which they seek advice on cross-breeding, arguing that their farms are so badly overrun by steekgras (*Aristida*) that merino sheep can no longer thrive on them, and stating that in order to build up the weakened constitutions of their animals, they are compelled to resort to this expedient.

For a better understanding of the present position and its problems, it is perhaps desirable to outline the historical background of the industry.

Trend of Wool Prices.

The average export prices of wool from the Union for the past 96 years are represented by graphs drawn on a basis of 7d. = 100—(6·8d. was the average price of wool for the period 1910-1914). From a first glance, it must be clear to readers that tremendous long term and short term fluctuations characterised our wool market, and that from year to year, farmers were obliged to adapt themselves, however reluctantly, to the new prices.

Graph 1.—A few of the peaks in Graph 1 are interesting. The first was reached in 1936, when the average export price exceeded that of the world market by about one penny. The reason for this was the disagreement between Australia and Japan, which resulted in Japan's decision to leave the Australian market and to buy solely from South Africa.

The second peak was reached during the boom years during and after the Great War of 1914-1918, when wool was sold in the Union for as much as 85d. per lb. and the Union wool clip brought in the enormous sum of more than £24 million. In 1932 the price of wool fell to the lowest known level, viz., 4·4d. per lb. on the gold-standard basis.

The third peak of the wool market fell in the period 1870-1875, most probably as a result of the Franco-Prussian War. From 1875 onwards the wool market fell steadily, in spite of a few flickerings, and until some time after the Anglo-Boer War prices remained low.

A fourth peak was reached during 1850 and the ensuing years. Although lean years were known, prices on the whole were good.

The reasons for these high prices cannot be precisely determined, yet the writer is of the opinion that it was a result of the development of the carded-wool industry in France and other European countries from 1850 onwards. At this time England was far ahead of any other country as regards the development of woollen mills. In 1850 the French Government sent a delegation to England to study the English wool trade. The astute delegates immediately noticed that the English concentrated mainly on the manufacture of long wool and paid practically no attention to short wool. They returned to France and concentrated on the processing of short wool. This was the beginning of the carded-wool industry which brought prosperity to wool farmers in this country.

Wool Production in O.F.S.

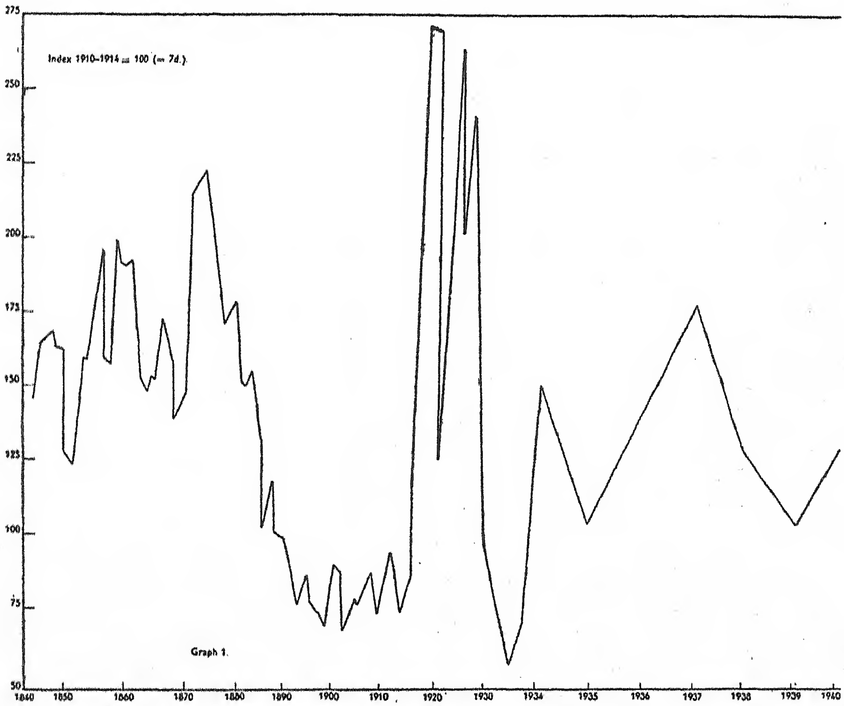
Graph 2.—In confining ourselves mainly to the wool industry in the Orange Free State, it is necessary to refer to Graph 2, which represents the wool production from 1921 to 1940—a period of great prosperity. From this graph it will be clear that a close correlation exists between the number of sheep and the quantity of wool produced. From 1917 to 1921, for example, 43,971,000 lb. of wool were shorn from 8,058,000 sheep, whereas 50,133,000 lb. of wool were shorn from 8,054,000 sheep during the years 1935 to 1939, i.e. during the latter period 18,000 more bales of wool, calculated at 340 lb. per bale, were obtained from practically the same number of sheep. This figure is very gratifying and proves that great progress has been made in the Orange Free State during the past 20 years. The peak of the graph was reached in 1931 when the Orange Free State clip amounted to 76 million lb.

Number of Live Stock in O.F.S.

We now come to Graphs 3, 4, and 5, which rank highest in importance. These graphs represent the numbers of merino sheep, cattle and other sheep in the Orange Free State.

The merino sheep industry in the O.F.S. expanded very rapidly after 1850, when the first merinos were imported into that State, and by 1890 it had almost reached the 6 million mark. The Volksraad of the O.F.S. did much to encourage the industry, as appears from the following: In 1870 the Volksraad passed a law against the "boetebossie", and under this act any farmer trekking with sheep infested with boetebossie was liable to a fine of £5. In 1885 an effective law was also introduced against scab. As a result of the activities of the Volksraad, a Wool Market was established in Bloemfontein in April, 1865. In order to encourage farmers, the Volksraad offered four prizes on the wool market, viz., a first prize of £20 for the best quality wool on the market, a second prize of £10 for the second best quality wool, a special prize of £10 to the farmer marketing the largest quantity of wool and, finally, a special prize of £10 to the farmer bringing his wool from the most distant point. This market was a total failure, however, because wool buyers from the coast could not reach Bloemfontein owing to complete lack of transport; railways and motor-cars, of course, were still unknown. Farmers were therefore obliged to send their wool to the coast by

ox-wagon. From authoritative documents of that period it appears that transport contractors charged 24s. 6d. per bale for delivering the wool at the coast. Dishonesty was rife, and many a wool-grower had to be satisfied with a small quantity of merchandise in payment for his clip. The story has been told of how, when farmers entered the office of the sales manager and politely enquired about the wool market, the manager would, by means of a speaking tube, consult the so-called wool buyers, who were in fact members of his staff in another part of the building. These trained clerks would then reply through another tube that "the market was very poor". Because of the continuous "poor" markets some farmers rolled their wool in sand before baling and even put stones in the bales to increase the weight of their clip.



Graph 1.—Average export wool prices for the past 96 years.

As has been indicated above, the merino sheep industry made rapid progress as regards the numbers of animals kept. After the Rinderpest in 1896 and the Anglo-Boer War, the number of merino sheep in the O.F.S. fell very sharply to 2·4 million in 1904. The industry recovered very rapidly, however, and in 1911 again numbered 7·3 million sheep. The industry maintained its progress and in 1931 reached another peak, when the Province could boast of more than 13 million sheep. Thereafter, on account of the severe drought, the number again fell sharply to 7·2 million in 1935. During the ensuing years the industry flourished once more and by 1937 the

Province again had 9·1 million sheep. From 1937 onwards, however, sudden and serious setbacks followed. The number of sheep rapidly fell to 8 million in 1938 and to 7·5 million in 1939.

In 1940 the number again rose to 8·5 million and in 1941 once more fell to 8·3 million.

If these fluctuating figures are compared with those of cross-bred or non-woolled sheep (Graph 4), it will immediately be noticed that the latter have gradually increased since 1931. In 1935, the Free State had 482,000 non-woolled sheep, which gradually increased to 894,794 in 1941, i.e. the population almost doubled itself. Judging by numbers, therefore, this industry is flourishing.

The cattle industry, too, made good progress as far as numbers are concerned (Graph 5). In 1935 there were 1·6 million head of cattle in the O.F.S., and in 1939 the figure had risen to 2,093,000, i.e. the highest point ever reached in the Free State.

Why Merinos suffer Setbacks.

A burning question now arises, viz.: Why do our non-woolled sheep and cattle industries flourish whilst our merino sheep industry shows no gradual progress? The writer cannot believe that the fluctuating wool market alone will affect the numbers of merino sheep to such an extent. Factors of a radical nature must be operating, and the actual fact is that during the past decade enormous losses have been suffered by merino herds in the Free State. During the period 1937-1938, for example, no fewer than 360,000 sheep died from diseases, 20,000 were killed by vermin and 46,000 were missing. These enormous losses occurred largely among two-toothed and four-toothed young sheep, as will be apparent from data obtained from a few farms which are representative of many more.

In 1939 the losses were as follows:—

- Out of 200 lambs Mr. A. retained 21;
- Out of 700 lambs Mr. B. retained 400;
- Out of 500 sheep Mr. C. lost 382;
- Out of 485 sheep Mr. D. lost 130;
- Out of 500 sheep Mr. E. lost 150, and during the past year he lost 600 sheep.

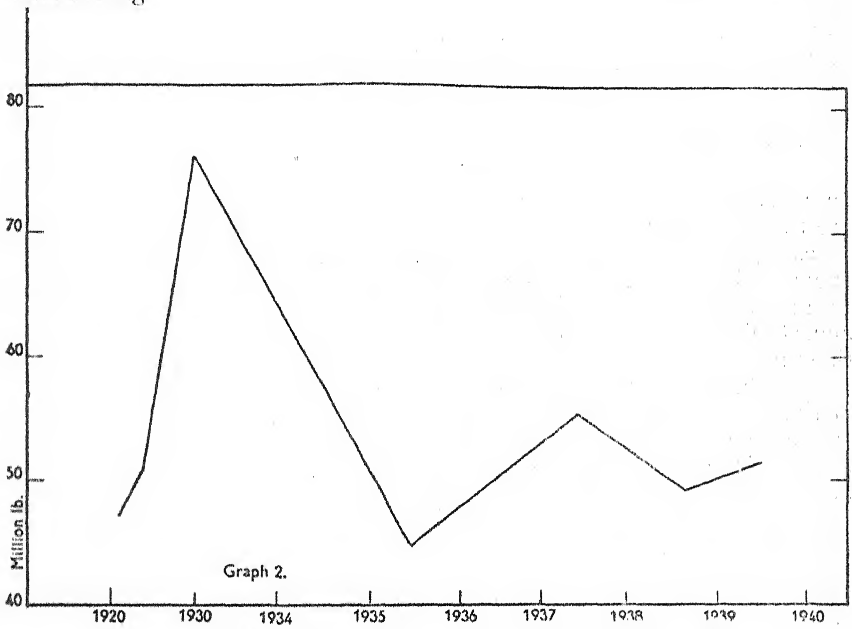
These figures are indicative of the position obtaining on many farms since 1935, and the question now arises: Why do so many sheep die? If the mortality had not been so high, there would probably have been more than 10 million merino sheep in the Free State to-day.

Undoubtedly we are still unacquainted with all the underlying factors and cannot even claim knowledge of all particulars concerning every factor involved since sheep-farming is beset with a series of problems linked and interlinked in such a way that the results of the one become the cause of the other. In this article, however, the writer will endeavour to point out a few of the most striking causes:—

(*a*) Condition of our Grazing.

There are a few exceptional farms in exceptional districts, but, generally speaking, grazing is in an extremely poor condition on account of droughts (especially the great drought of 1933), veld-

burning, over-stocking and soil erosion. In the southern, south-eastern and south-western Orange Free State steekgras (*Aristida*) and bitterbos are the dominating types of vegetation to-day. Further west, steekgras covers the veld for miles, a condition which is also encountered in the central southern Free State. In the northern, north-eastern and eastern Free State suurpol, taaipol and hard *Eragrostis* practically dominate the veld, but fortunately red grass (*Themeda triandra*) is still abundant in these parts. Yet on some farms even in these areas, annual and perennial steekgras is rapidly encroaching.



Graph 2.—Wool production in the Union from 1921 to 1940.

This encroachment of the unpalatable shrubs and grasses is the natural outcome of the factors mentioned above, and has been going on for many years. The enormous livestock population of the years before 1930 was undoubtedly a very heavy burden on the edible grasses in the Orange Free State, especially red grass. The great drought of 1933 destroyed many of these more sensitive grasses, and subsequently their increase could not keep pace with the more rapidly increasing livestock population, i.e. Nature simply ignored the needs of the farmer. The position created by the drought is aggravated by such general malpractices as veld-burning, bad veld management and overgrazing, which can be briefly summarized as follows:—

Veld-burning.—On many farms it is the general practice to-day to burn the cover of dead grass annually in September and August, but some farmers go as far as to burn the veld in mid-summer, if the grass is dry enough. Many farmers make this a regular practice, even in mixed grassveld areas. Some burn a portion of their veld every second or third year, while others again burn only occasionally when the grass becomes too dense. On this

point farmers are sometimes too eager to believe that the grass cover is too dense. Last year, for example, farmers in many parts of the Orange Free State tried to burn their veld, but the grass was so short that only scattered black patches resulted.

Overgrazing.—With few exceptions, farms are to-day being grazed very heavily, or even completely overgrazed. Overgrazing implies that a farm carries too many animals for its edible vegetation, with the result that the plants can never rest in order to restore their root systems or to run to seed and so to propagate themselves. The edible and palatable grasses or shrubs are always kept short and eventually die. There is, therefore, a marked contrast between overgrazed and lightly grazed farms. On the latter where the vegetation, including red grass, is abundant, a general state of prosperity exists, animal mortality is reduced to a minimum, and sheep are in good condition.

Veld Management.—Judicial veld management is rare to-day. In most cases all camps are grazed simultaneously and the animals are removed only when they show signs of "camp-sickness". In other cases again, the same camps are reserved for both summer and winter grazing, instead of being grazed in rotation. Some farmers actually think that they are resting the veld if they keep sheep out, but nevertheless allow all the cows, horses and/or calves free grazing thereon.

Such, therefore, is the condition of our veld to-day as a result of these practices. During spring, the sheep graze on the burnt veld, which is short and palatable, or on other young grasses, and the farmer is able to utilize his whole farm. After a few months, however, the steekgras, *Eragrostis*, suurpol and taaipol become more and more unpalatable, with the result that the animals simply refuse to eat them, and continue grazing on the remaining edible grasses, i.e. the farmer now utilizes only from a quarter to one-tenth of his farm, depending on the stand of red grass or other edible shrubs and grasses.

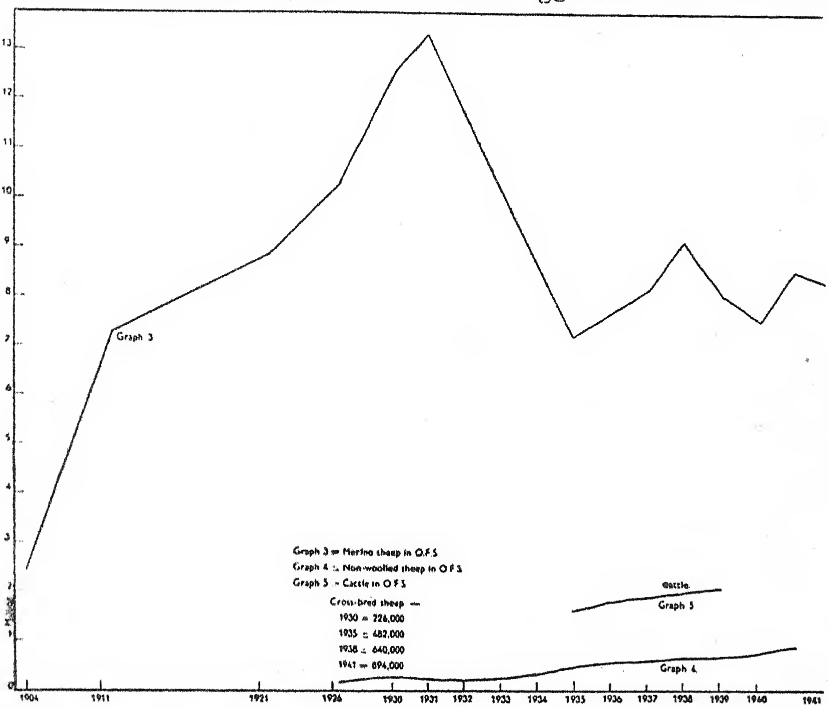
Soil erosion.—This evil is steadily increasing its menace, and many farms are to-day little more than a maze of dongas and sluits; it is a wonder that man and beast can still manage to exist on them.

(*b*) Internal Parasites.

The condition of the veld, however, is not the only cause of setbacks in sheep-farming. Worm infestation is, perhaps, a much greater limiting factor than the condition of the veld and may be the cause of greater mortality among sheep in the Free State than drought together with all other diseases. The fact cannot be overemphasized that internal parasites, and especially nodular worm, to-day constitute one of the greatest menaces to sheep-farming. Farmers have in the past been impoverished and driven from their farms by worms in sheep, and the same fate awaits many another.

On most of the Free State farms, the lambing season falls in the period September-October. The lambs are infested with tape-worm practically from birth, and as soon as they begin to eat and to drink water, they are infested with wire-worm as well. Before or immediately after weaning, the lambs are dosed with Cooper's Dip

or some other remedy. Most of our common worm remedies are effective against wire-worm and tape-worm and consequently these worms are easily killed, especially if the sheep are regularly dosed. Unfortunately, dosing does not take place regularly, and since young sheep are very sensitive to worms, they are severely affected by nodular worm. Diarrhoea sets in and the animal loses condition. Towards February, March or April its condition has deteriorated to such an extent that, though grazing may be good and abundant, the animal must be given green feed, which aggravates the diarrhoea



Graphs 3, 4 and 5.—Number of livestock in the O.F.S.

and soon leads to the death of the sheep. This state of affairs continues from day to day, until by the end of winter the farmer retains only from twenty to thirty per cent. of the lamb crop of the previous year.

Actual deaths are not the only losses suffered by the sheep farmer, for parasite infestation often keeps the animals in poor condition. They become emaciated, have a stunted appearance and are little more than walking skeletons. Disease in sheep leads to poor wool yields of inferior quality. There are cases on record of six-toothed hamels which did not weigh more than 20 lb. live weight.

The poorer the veld, the lower the resistance of the sheep to parasites. Such animals do not attain maximum growth and consequently their constitution suffers. The writer of this article classes several thousands of sheep every year, and he cannot help noticing the lack of size in two-toothed and four-toothed

sheep. As regards conformation, they are hopelessly under-developed, and no remedy or treatment can ever rectify this condition.

Poor Lamb Crops.—Finally, and this point is of enormous economic importance, ewes infested with such parasites experience no oestrus or only partial oestrus. The result is extremely poor lamb crops.

Good lamb crops can be obtained only from well-fed and healthy ewes, provided a sufficient number of rams is used and the mating time is long enough. From underfed ewes, infested with parasites, no good lamb crops can be expected.

(*c*) Small Farms.

A further source of trouble lies in the fact that many farms are so small that they have become not only uneconomical but quite unfit for sheep-farming. In many districts in the Orange Free State, farmers who previously engaged in profitable merino sheep-farming are to-day trying to earn a livelihood on small farms after having been compelled to abandon sheep-farming. Many more will perforce have to tread the same way. The main reasons for this step are the deterioration of the veld as a result of the constant concentration of livestock on such small farms and the final blow dealt by parasites. There farmers may dose regularly enough, but their sheep are just as regularly driven back to the same worm-infested camp, where they again pick up as many worms as were killed in them the previous day. In short, on small farms rotational grazing is impossible, and to aggravate matters, half the surface of these small farms is usually ploughed. Consequently these sheep farmers cannot avoid the parasite for a single day.

Broadly speaking, this is the picture of the position of merino sheep-farming in the Orange Free State to-day. On the other hand, non-woolled sheep are doing well. Why? The following are, perhaps, some of the reasons:—(1) High fertility, (2) early maturity, (3) merino ewes are still constantly being used for cross-breeding, (4) non-woolled sheep are more resistant to bluetongue and consequently better adapted to winter conditions, (5) steekgras and blowfly do not affect them, (6) non-woolled sheep are, perhaps, more resistant to internal parasites owing to better constitution peculiar to crossbreeds, (7) the young hamels are fit for the market at an early age and have a ready sale. In addition, the farmer is not compelled to tether the non-woolled ewes during the lambing season—a fact which renders this type of farming more attractive, and (8) many farmers put a few cross-bred rams among their merino flocks after the merino rams have been removed, for serving the merino ewes which have not taken. Perhaps the key to the problem may be found in the solution to the question: "Are the physiological and constitutional characteristics of the non-woolled sheep not better adapted to the lower level of feeding and prevailing environmental condtions than those of the merino?"

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Paspalum Dilatatum as a Fodder Crop.

R. Norval, Technical Assistant, Athole Research Station.

PASPALUM DILATATUM known in America as Dallis grass is a sub-tropical grass indigenous to the Argentine and possibly also to the Gulf States of North America.

This grass thrives best in a hot climate with a high rainfall, and although it does well on a fairly dry and poor soil, a slightly heavy, clayey soil seems to be most suitable, particularly when damp and marshy. The grass is also capable of resisting fairly protracted periods of flood waters and is resistant to drought in an exceptionally high degree. For this reason it is regarded as one of the grasses which is best adapted to extreme climatic conditions.

On loose and sandy soil the roots penetrate to a depth of several feet in search of moisture, but on soils with a hard substratum they are sometimes injured by heat. With sufficient plant foods, however, this grass sometimes thrives long after other pasture crops have dried out.

Paspalum dilatatum grows best during summer. The plant grows rapidly, has a strong root system and is perennial. Individual plants spread in a lateral direction to a considerable distance through the development and growth of short, subterranean rhizomes. In this way plants established a foot or more apart are capable of covering the entire surface of the soil with a dense carpet within a year or two.

The leaves, which are long and broad, are first produced by innumerable crowns of the plant and subsequently appear at regular intervals along the flowering stems. The plant is very palatable and nutritious when in full leaf. Even while the plant is flowering, palatable leaves are continually being produced. If the grass is kept short by grazing or cutting, new leaves which are ideally suitable for grazing are continually being produced.

Paspalum dilatatum propagates itself very well where climatic conditions are suitable and where for one reason or another, other pasture grasses do no thrive.

Since the cultivation of *Paspalum dilatatum* is still in its initial stages, there are naturally considerable difficulties in connection with the control, management and utilization of this grass, but as farmers are becoming obliged to develop their methods of management, the outstanding qualities of the grass are being brought to light more prominently. According to experience gained during the past few years, disadvantages which were formerly attributed to the grass, as for example, the tendency to oust other pasture crops, its failure to provide feeding during winter and spring, its hardness during late summer and autumn and the decrease in yield, must be ascribed to incorrect methods of management.

Sowing of *Paspalum dilatatum*.

The rate of seeding is 30 to 40 lb. per morgen. For the best results the seed should be 2 to 3 years old, since it ripens very slowly, even after it has been reaped. Since the seed does not ripen uniformly, it is only natural that germination should not be uniform either. Consequently, in the past farmers have frequently ploughed under large patches of paspalum because they were not satisfied with the stand. When climatic conditions are favourable, seed sometimes continues to germinate months after it has been sown. The best time for sowing is during the months October-November when the rainy season commences, but in this case care must be taken to ensure that the soil has been well cultivated and is free from weeds, otherwise the paspalum plants are liable to be stifled by the rapidly-growing weeds. If the soil is not completely free from weeds, it is better to sow in Autumn (February-March) so that the plants can become established immediately before the winter, and since the weeds are killed by frost in winter the paspalum plants are able to get a start the following spring.

The soil must be ploughed thoroughly, broken up with a disc harrow and subsequently with a heavy harrow, so that it is absolutely fine and loose when the seed is sown.

After the seed has been sown it should be harrowed in lightly, since it must not lie at too great a depth in the soil. It is advisable that the soil should be rolled with a "Cambridge" or heavy wooden roller. This process accelerates germination and prevents the soil from drying out too rapidly.

If the seed is sown in spring the first cutting for hay can be made before the winter.

Fertilizing.—A mixture of super and rock phosphate in the proportion of 1:2 is applied at the rate of approximately 400 lb. per morgen just before the soil is treated with the disc harrow. In this way the fertilizer is thoroughly worked into the soil before the seed is sown. Subsequently the same quantity must be applied annually, in addition to 200 to 400 lb. ammonium sulphate per morgen.

Weed Encroachment.—*Paspalum dilatatum* is not readily ousted by any other grass or by weeds, and at certain places this grass has established itself without any assistance and also become predominant. It has been found at the Athole Research Station, however, that if "taaipol" (*Eragrostis plana*) is not controlled, it increases very rapidly and considerably reduces the quality of the paspalum pasture and hay.

Farmers sowing paspalum must, therefore, take great care from the outset to keep the pasturage free from these weeds before they have an opportunity to spoil the stand and reduce the value of the grazing.

Haymaking.

At the Athole Research Station *Paspalum dilatatum* yields 4 to 5 tons of good quality hay per morgen. It is cut twice, since it is naturally better to obtain two smaller cuttings of good quality hay than one large cutting of old unpalatable and, consequently, superior hay.

The chief aim in the making of hay is to obtain the largest quantity of material with a high nutritive value and with as little loss of green leaves and palatability as possible. To achieve this object it is necessary for the paspalum to be free from weeds, to be cut at the correct stage and to be properly dried. The best stage at which to cut is when the first seed blades start flowering, since this is the stage when there is the maximum quantity of dry material with a high nutritive value. If the grass is cut too soon, the maximum yield cannot be obtained even if the nutritive value is exceptionally high. If, however, the grass is left until the seed begins to ripen, the nutritive value of the hay is considerably reduced owing to the fact that the grass becomes fibrous; its protein content and digestibility are also reduced.

The most rapid method of drying must be employed. In the eastern Transvaal where sunny days are rare in summer, a drying rack is very useful. As soon as the hay has been wind-dried, it is placed on the rack instead of in the usual cocks. In these racks the hay dries rapidly and can even resist long periods of rain without danger of deterioration. The principle is that the hay should not come into contact with the ground and that there should be a continuous current of air under and inside the stack in order to prevent the development of mould.

Handling must be reduced to a minimum to prevent breakage and loss of the valuable small leaves and other parts. It is also desirable to have the hay in the stack before it is quite dry and inclined to become brittle. If the hay is not packed in large stacks or stored, but left in a small stack on the land, a roof may be erected over the stack. Four poles are planted in the ground and the hay is then packed between them, well compacted and neatly combed out along the sides. The roof consists of old bags drawn over a framework of wooden poles and fitting exactly into the space between the poles so that it can be lowered from time to time as the hay is reduced. In order to prolong the life of such roofs and render them more waterproof, the following treatment may be applied: 6 parts cement and 1 part salt should be mixed with water to the consistency of thin cream and applied to the bags, or the bags may simply be painted with coal tar. The latter method is probably the most suitable, since it is cheaper and, moreover, the cement is inclined to crack in the wind. Another method is to cover the roof with grass. This would probably take more time but would considerably prolong the life of the roof.

Silage.

Silage of high quality may be made from *Paspalum dilatatum* with or without other crops.

In making silage there are a few points to be taken into account. The silo should, for example, be airtight and waterproof in order to retain as much of the valuable proteins as possible. In this connection it should be borne in mind that the carbohydrate content of the grass is so low that it is not possible for adequate quantities of lactic acid to be formed during the fermentation process to prevent decompo-

sition and the formation of undesirable butyric acid, the presence of which indicates that the proteins have been broken up. Consequently, it is essential for carbohydrate to be added in an easily fermentable form, viz., in the form of mealie meal, mashed potatoes, sugar, etc. The cheapest and most effective form of carbohydrate is, however, molasses which contains large quantities of readily fermentable carbohydrate in the form of sugar and can be applied without any difficulty. It is obtainable from sugar factories at approximately 3d. per gallon, which is equivalent to about 15 lb.

The molasses is applied by dissolving the required quantity in water until a homogeneous solution is obtained. This solution is then applied with the aid of an ordinary spray pump with its nozzle set in such a way that the solution is sprayed in a fine mist; an ordinary water-can can also be used. The solution is sprayed on to the material while the silo is being filled; care should be taken, however, to ensure that, as far as possible, all the material is moistened. It has been found that 38 lb. molasses per ton of material furnishes sufficient fermentable carbohydrate to produce a good quality silage. Larger quantities of molasses may be added, since it is inexpensive and the excess of sugar is not lost in the fermentation process but assists in balancing the ration by increasing the carbohydrate content.

When 38 lb. or 2½ gallons of molasses, which is equivalent to 1 per cent. sugar, is added per ton of material, the costs will amount to 7½d. per ton of silage. Approximately 16 gallons of this watery solution is necessary for every ton of material.

Renewal of *Paspalum*.

After *Paspalum dilatatum* has been established for a number of years, it becomes what is generally known as "rootbound" and this condition causes a considerable decrease in productivity. This is merely due to a deficiency of plant food which can be remedied by loosening the soil well in order to render it more permeable to moisture and to give the bacteria in the soil an opportunity to function and to retain sufficient plant food.

The chief object in renewing grazing is its restoration in the most economical manner in order to obtain and, as far as possible, to maintain the production of the previous year.

The most effective method of loosening soil is by means of an ordinary plough from which the mould-boards have been removed. In this way the soil can be loosened deeply and thoroughly without the sods being turned.

Finally, it must be stated that the danger of poisoning in animals by the fungus *claviceps paspalii* may be ignored, since this fungus occurs only after the seed has been formed, by which time the hay should have been cut. Tests have revealed that as much as 9 lb. of seed must be infested by the fungus before the first signs of poisoning appear.

The New Fertilizer Mixtures.

Compiled by the Division of Chemical Services in Co-operation with all other interested Divisions of the Department of Agriculture and Forestry.

IN consequence of the difficulties connected with the importation of fertilizers, the Department of Agriculture and Forestry has found it expedient and in the national interest to impose certain restictions on the trade in fertilizer mixtures, largely with the object of ensuring that available supplies are used to the best advantage. By eliminating unnecessary costs resulting from the manufacture and storage of a large variety of mixtures, the cost of the farmer's fertilizer requirements can be kept lower, but although fertilizer prices are already controlled, they are very high and every farmer should do his best to reduce his expenditure under this head. It is not suggested that this should be done by using less fertilizer and starving the crops; but by doing everything possible to use only those fertilizers which are best suited to the particular case, no money need be wasted on inferior substances or expenditure incurred on costly ingredients of which his soil is not really in need.

The Department has already decided to limit the number of fertilizer mixtures on our market containing more than one of the active constituents N, P or K to eight as from 1 April 1942. These mixtures will be designated by the letters A to H, followed in each case by numbers denoting the content of plantfood ingredients in the order N : P : K, according to international custom. The first number would, therefore, indicate the percentage amount of N (nitrogen); the second the precentage P_2O_5 (i.e., phosphoric oxide to the extent in which this ingredient is soluble in a 2 per cent. citric-acid solution and, therefore, more or less available to plants); the third the percentage K_2O (Potash). It will, therefore, be evident that mixture A 0:14:6, for example, contains no nitrogen, 14 per cent. available phosphoric oxide and 6 per cent. potash, whereas mixture B 2:12:6 contains 2 per cent. nitrogen, 12 per cent phosphoric oxide and 6 per cent. potash. Full details are given below about the only eight mixtures which will be procurable as from April. Owing to the experience in this country that in the vast majority of cases no crop can be successfully grown on our soils for any considerable time without liberal applications of available phosphate (P), all these mixtures contain large quantities of such phosphates.

The New Mixtures.

A 0:14:6.—This mixture is recommended for crops known to have high potash requirements but where at the same time nitrogen is of little value or may even be harmful. The outstanding example of this is where light tobacco for flue-curing is grown on "black turf" and other heavy soils. As such soils are generally able to supply the tobacco plant with all the N it requires for healthy development, particularly if kraal manure, compost or greenmanure

was applied to the previous crop, the addition of easily assimilable N in the fertilizer may give rise to a " heavy leaf " which will give an inferior cured product.

Leguminous crops, in particular lucerne, are great consumers of potash, but have the property of taking up free atmospheric nitrogen, satisfying their own requirements and enriching the soil with nitrogen compounds. As lucerne is commonly grown under irrigation on alluvial soils which are somewhat depleted in K, this mixture may frequently be very useful for such lucerne.

Sugar cane is a further example of a crop that frequently reacts to a K fertilizer. However, as it may be wasteful to apply easily soluble N compounds to this crop at planting, mixture A may also be recommended for plant cane.

Other crops known to have a high potash requirement include roots of various sorts and many vegetables, potatoes, sweet potatoes and most fruit trees, but as the N requirements of these crops are fairly high too, other mixtures are generally preferable. Where the practice is to give the necessary N as a top-dressing, or where the soil is particularly well supplied with nitrogen (e.g., vlei soils rich in humus or lands where leguminous crops have been ploughed in), this mixture could also be considered for mangolds, peaches, etc.

B 2:12:6.—This mixture can be recommended for the same crops as A 0:14:6 but should be given preference if the soils are lighter (sandy). It is also very useful for these crops where for some reason or other it is considered advisable to give the young plant a small amount of easily soluble nitrogen (e.g., light tobacco and even lucerne on soils of low fertility). Should moisture conditions be unfavourable, this mixture (and to a lesser extent also mixture A) should preferably not be used, since the high percentage of N and K salts combined may give rise to " burning ".

C 2:12:2.—This mixture can be used for a great variety of crops, soils and conditions, especially where some doubt exists as to the adequacy of the water supply. It contains a relatively large amount of available P, but the small amounts of the other two important plantfood constituents may be very useful in furthering the initial growth, before the root system or other factors have succeeded in mobilizing the less available natural soil supplies for the use of the young plant. In general, however, it may be said that this mixture contains too little N and K to suit the requirements of crops that feed heavily on these constituents. Yet, if a fair amount of natural manure, which usually contains fair quantities of these elements, is also available, mixture C might be used with good results under dry-land conditions for potatoes and root crops. Its main use, however, is for crops and on soils which do not have a particular need of N and K. It can be regarded as a substitute for a straight phosphatic fertilizer, by all farmers who are not solely concerned with the immediate cash return given by the fertilizer, but are also desirous of protecting their soils against undue depletion. Where irrigation is practised the yields are commonly so high that the small quantities of N and K supplied by this mixture would be inadequate and, therefore, it is not recommended.

It may be mentioned here that stocks of ammonium sulphate, our best-known and most common N fertilizer, are likely to be inadequate for several seasons. It is, therefore, presumed that mixture C will usually contain its N in "organic form" (e.g., fishmeal). This N compound possibly has certain advantages over the "mineral form" of N (sulphate of ammonia) but, on the other hand, it is less readily available to the young plant. Thus, should an *immediate* action of the N fertilizer be required, it would be advisable to use another mixture or a top-dressing of Chili saltpetre or sulphate of ammonia.

D 3:13:3.—The Department considers that this mixture would usually be preferable to mixture C 2:12:2 where a "complete fertilizer for general use" is required. It ought to replace the latter for crops with only moderate requirements of N and K but grown under irrigation. For crops which make great demands on the soil for these two constituents, this mixture may also be very suitable under dry-land farming conditions, where the moisture factor is not too uncertain.

Mixture D is, to an even larger extent than C, a basic mixture that is suitable for a wide range of crops and conditions. With the application of suitable top-dressings either the N or the K can be brought up to the level necessary for different crops or soils. If given after green-manuring or the application of compost it is suitable for crops with a high N requirement. In conjunction with Karroo manure it can be used for crops which are marked potash feeders, and with a good quality kraal manure or stable manure it would suit crops requiring liberal amounts of all three essential ingredients.

E 4:12:0.—This mixture was decided upon with the particular object of meeting the requirements of wheat in the western Cape Province and in the eastern Orange Free State, where experience has shown that the soils are still generally sufficiently well supplied with K to supply the needs of a fairly good crop. Naturally, the general rule also holds in this instance that steps must be taken to guard against undue soil depletion, and, therefore, a system of crop rotation should be practised which provides for a potash dressing in some form or other, whilst with the return of normal conditions this mixture should on occasion be replaced by one containing potash.

Mixture E could frequently be used with advantage for other grain crops, especially where these are grown for pasturing or forage and where leaf production is aimed at. For pasture and hay crops generally, as well as for maize grown under irrigation for silage, mixture E can be recommended with the proviso that many pastures (without legumes) will need additional N as a top-dressing.

F 4:10:6 and G 6:10:3.—As the figures of composition show, both these mixtures are "complete fertilizers", containing large amounts of all three essential plantfood elements. They are, therefore, suitable for crops with high K and N requirements, and can be conveniently discussed together. Where large crops of this type are removed from the soil, e.g., under irrigation and regular rainfall, it is usually best to use one of these mixtures. Although they can frequently replace each other, especially if prior treatment and the

use of the land are taken into account, it will be evident that F is intended particularly for crops requiring a great deal of potash and G for those showing a decided need for nitrogen.

In the first group fall those crops which have already been named under mixture A, with this difference that the soil must be definitely poor in nitrogen, e.g., soils that are very sandy or have become relatively exhausted. Examples are: light tobacco grown on poor sandy soils, potatoes grown without heavy application of manure, roots grown intensively as vegetables, orchards and vineyards lacking sufficient farmyard manure or greenmanure, ratoon sugar cane.

On the other hand, mixture G is particularly suitable for high-grade pastures in areas where the soil has been to some extent leached of K (Mist Belt). Frequently it is even essential to give a few applications of nitrogen as a top-dressing a few times during the year. Grass lawns, flowers, leaf vegetables (greens) and citrus are further examples of crops that will usually respond well to this mixture.

H 8:10:0.—This type of mixed fertilizer is intended only for certain special uses as it contains too high a proportion of N for most purposes. In those cases, however, where the crop requires exceptional amounts of N and the soil is well supplied with K, either naturally or as a result of previous heavy applications of Karroo or kraal manure, it may be used with advantage. It may thus replace mixture G 6:10:3 for established pastures or lawns. Frequently also, conditions are such in our citrus orchards and cane fields that for limited periods this mixture may be very useful.

Price of Fertilizers.

It has always been and still is the policy of the Department not to encourage the indiscriminate use of fertilizer mixtures, but rather to assist the farmer in establishing the fertilizer requirements of his crops on his different soils by using single constituent fertilizers. For in this way money can often be saved on expensive constituents which the soil requires only in limited amount or not at all. However, with the assistance of co-operative experiments and the practical experience of progressive farmers, certain fertilizing formulae have been tested out in the course of time and the fertilizer requirements of crops in certain areas have been fairly well established, so that farmers frequently find it more convenient to use mixtures. The Department, therefore, trusts that the eight mixtures will satisfy the needs of all such farmers.

In the past it frequently happened that a farmer made up his mind to buy a particular mixture, not on the strength of its composition, as should be the rule, but either because the price was low, or the name, such as " special maize ", " wheat No. 1 ", " potato ", etc., appealed to him. As it was not uncommon to find that the same mixture was sometimes offered under four or even more special names for crops which might even differ fundamentally in their requirements, or that totally different mixtures were put up by different firms under the same special crop name, a considerable amount of confusion was caused and farmers were sometimes misled into buying

expensive mixtures which were not suitable for their specific needs. The new mixtures will not be sold under crop names, and a particular mixture will have to be offered by the different fertilizer firms at practically the same price. However, the different mixtures will differ materially from each other in price as the unit of N at present costs approximately two and a half times as much as the units of K and P, which are roughly the same price. Mixture C will, therefore, be the cheapest, followed closely by A. The relative money values of the active ingredients in the eight mixtures discussed in this article can be expressed in round figures by the following numbers:—

Fertilizer	A	B	C	D	E	F	G	H
Value	105;	120;	100;	125;	115;	135;	145;	155.

Should mixture C, for argument's sake, be offered at 150s., i.e., £7. 10s. a ton, mixture B would be worth about 180s. or £9 a ton and H approximately £11. 12s. 6d. There is no justification for farmers to buy the cheaper mixtures as they may actually be a more costly investment than the more expensive ones, which, if better adapted to the needs of the particular crops, would usually give far higher yields.

Quantities of Fertilizers.

From the foregoing it will be clear that in a short general article such as this it is not possible to give precise instructions as to the sort or quantity of fertilizer that should be used in any specific case, since factors such as soil characteristics, cultivation, rainfall, climate, previous crops, etc., all have a marked influence.

Three of the factors that have a particular bearing on the *type* of fertilizer that should be used are soil fertility, moisture conditions and the use of natural manure. At this point it must be stressed once again that good organic material is still considered one of the best means at the disposal of the agriculturist to maintain the fertility of his soil. Unfortunately on most farms supplies of natural manure are very limited and the Department has, therefore, been active in making propaganda for several years now with a view to encouraging farmers to augment their supplies of animal manure by making compost. This matter cannot be discussed here, but readers should consult the various Departmental publications that have appeared on this question. In general it may be said that where fair quantities of natural manure (this term includes compost) can be used, a suitable phosphate is the only fertilizer required.
Sometimes mixtures consisting of superphosphate with soft rock phosphate, with bonemeal or with lime are refferred to superphosphate alone. These mixtures contain ony one of the specified active constituents (P) and will still be permissible under the amended regulations. If the water supply is uncertain (e.g., very low or irregular rainfall) the general rule should be not to use mixtures containing 6 units or more of the soluble N and K compounds or to use them only with great caution. This also applies to Karroo manure. In such circumstances phosphates only, or mixtures C or E, depending on the needs of the crop and the soil type, are preferable. However, as soils of very low fertility, such as coarse sands and other soils that have been greatly depleted, cannot be expected

to give satisfactory yields with P alone, it will frequently be necessary to fertilize them with mixtures C (or D), E, A, according to the crop to be grown, where moisture conditions are not too good. Where the water supply is assured, preference should be given to G, H, F (or B).

Finally, it must be pointed out that, whereas it is the general experience that phosphates increase our yields, an application of N fertilizer seldom gives an increased net income (established pastures and citrus are well-known exceptions), and K fertilizer when used for crops other than tobacco and sometimes sugar cane and potatoes, still more rarely so. In times of scarcity or in other special circumstances the farmer would, therefore, be justified if for most crops he used phosphates only intermittently. However, as all crops remove large amounts of N and K from the soil, it means that the soil is being robbed if these constituents are not returned and that sooner or later our descendants will have to pay.

As regards the *quantities* to be applied, the general rule is that the bigger the crop is expected to be, the more fertilizer must be given. Moisture conditions will be a very important factor in regulating the amount of fertilizer to be applied to a particular crop. Different crops have markedly different requirements and whilst maize grown under dry-land farming conditions does not need more than 300 or 400 lb. fertilizer per morgen, a tomato crop may find 1,600 lb. per morgen barely enough.

How to Obtain Advice.

The efforts of the Department to assist farmers to save money on their fertilizer bill will be largely nullified if they do not take the necessary steps to acquaint themselves thoroughly with the meaning of the names of the new mixtures, with the particular purposes for which they are considered suitable, with the special needs of their soils, and with the general requirements of the types of crops they wish to grow. To take a case in point, a farmer who buys a mixture containing a high percentage of potash for a crop like mealies that can usually do quite well without it, not only wastes his own money, but deprives the tobacco farmer of the potash which is an essential constituent of a tobacco mixture.

The Department finds it necessary, therefore, under the stress of existing conditions, to direct an earnest appeal to farmers to study the composition of mixtures carefully before placing orders. Should they not fully understand the names and figures or if they are in doubt as to the needs of their soils and crops, they are reminded that the whole Department is still, as in the past, at their disposal. In the first instance the farmer should address himself to the Extension Officer, or College of Agriculture, or Experimental Station dealing with the special branch of agriculture concerning which advice is needed (e.g., deciduous fruit, pastures, tobacco). In addition, the Head Offices of the Department in Pretoria and of the various Divisions dealing with soils, fertilizers and cultivation of crops, such as the Divisions of Chemical Services, Horticulture and Animal and Crop Production, will always be ready to give fuller information concerning these mixtures and to advise farmers generally on fertilizer matters.

Wool Classing.

F. E. Hoffman, Sheep and Wool Officer and Wool Inspector, East London.

WITH the development of marketing methods in the wool trade, proper classing of wool has become essential. For years the Department has been paying attention to this aspect of the industry and, in addition to stressing the necessity of proper classing of flocks and the employment of good rams, it has also advised farmers to make themselves thoroughly acquainted with this subject in order to be able to undertake the satisfactory classing of their clips themselves. At present the sheep and wool section of the Department, in collaboration with the N.W.G.A., still renders assistance in respect of the classing of clips.

The sales of the past season proved that, under the present Wool Marketing Scheme, farmers who offered well-classed clips for sale were fully rewarded for their trouble and labour since they obtained the maximum prices obtainable under the fixed scale.

The Necessity for Classing Wool.

Wool is valued according to length of staple, fineness of fibre, quality or handle, soundness of fibre, scoured yield as a determining factor, general appearance, and presence or absence of seed. It is clear, therefore, that if the best results are to be expected, proper classing of the wool is essential.

It is impossible to indicate how every clip in the country should be classed, but in the case of merino wool, a very effective general outline may be sketched for the guidance of farmers.

Wool growers are advised to procure and make a thorough study of the revised Wool Classing Standards of the N.W.G.A.

These Wool Classing Standards give a broad and clear outline of the most important principles of wool classing. Wool treated according to these instructions should, therefore, be passed by all wool valuators as well-classed clips.

Shearing and Wool Classing.

For effective classing, shearing operations should be organized in such a way as to avoid the employment of a disproportionate amount of the available labour on shearing, with the result that fleeces and skirtings do not receive the necessary attention and treatment. Shearing requires sufficient space, the essential equipment, neatness and an orderly division of labour.

Fleeces, bellies and skirtings must satisfy the requirement in regard to uniformity, and classers should remember that correct and careful skirting constitutes the basis of effective wool classing. When skirting a fleece, attention must be paid not only to the removal of

lox, but also to the possibility of improving a fleece by removing portions such as the short cheek wool, the " crow's nest " and backs, coarse neck folds, coarse britches, and all shorter and discoloured portions which impair the desired uniformity of the wool.

A common mistake made in the classing of clips in to pack the secondary classes (bellies and pieces) in a slovenly manner and with a certain degree of carelessness, although the fleeces may have been treated satisfactorily. As a result, the clip as a whole fetches a lower average price per lb.

The number of lines into which a clip is to be classed, varies with each clip, and classers are advised to strive for maximum uniformity in each individual line. It should be borne in mind that as regards classing, uniformity of length, fineness, quality, condition and colour are the chief requirements.

Classers are advised against including fleeces which are considered pleasing or attractive, in lines in which they will interfere with the uniformity of length, condition and soundness of fibre. Bellies should not be baled together with fleeces, no matter how attractive the former may appear.

Seed- or bur-infested wool is fully dealt with in the Wool Classing Standards. Other things being equal, wool free from seed will fetch a higher price than seed-infested wool; consequently, it will prove profitable to skirt the fleeces in such a way as to remove as much seed as is practicable.

If possible, bales should not be loosely packed or half-filled.

Packing and Marking of Bales.

A proper display of the clip will to a large extent be ensured by attractive packing and marking of the bales, and the psychological effect which well-classed and well-marked clips will have on the buyer is of the utmost importance in so far as the sale of the wool is concerned.

Wool growers are reminded of the fact that they must comply with certain regulations governing the packing and marking of wool. The object of these regulations is to ensure that the good name of one of the major agricultural industries of the Union wil not be prejudiced in any way.

Nursery Quarantines.

The following nursery quarintines were in force on 1 February 1942:—

(1) Alkmaar Estates, Alkmaar, on citrus (all) for red scale.

(2) Municipal Nursery (Fountains), Pretoria, on ornamentals (part), for pernicious and white peach scales.

(3) Kildare Nurseries, Pietermaritzburg, on apples (part), for red and pernicious scales.

(4) Subkleve's Nurseries, Johannesburg, on deciduous fruit trees (part), for pernicious scale.

External Parasites of Sheep.

I. Keds, Scab and Mange.

R. du Toit, Veterinary Research Officer, Onderstepoort.

A GREAT number of enquiries are constantly being received at the various departmental institutions regarding measures applicable to the control of the external parasites of sheep, and it is evident that a great deal of confusion still exists in regard to those features of their life histories concerning which some knowledge is essential if we are to control or eradicate them with a fair chance of success.

In a subtropical climate, such as ours, conditions during the summer months are ideally suited to the rapid multiplication of insect pests generally, and even the winters over the greater part of the Union, are sufficiently mild to allow of some degree of propagation often only slightly below the normal summer rate of increase. This applies particularly to what might be termed the more permanent parasites of sheep which are aided in their depredations by the lowered resistance of their hosts due to the lowered nutritional standard of our winter pasturage. It is with this class of parasite that the present article deals.

The Sheep Ked.

The sheep ked, *Melophagus ovinus*, is a permanent parasite of sheep which derives its nourishment from the blood of its host by piercing the skin with its proboscis.

It is an extremely common parasite of sheep in many parts of the world, and it occurs in all the principal sheep-farming areas in the Union. It is rare in the more arid portions of the north-western Cape and, when introduced, appears to die out. It seems likely, however, that it will eventually adapt itself to conditions in this area as it has adapted itself to the central and southern Transvaal, where it is now common though it was not known to occur previously.

Description.—The adult ked (Fig. 1) is a wingless fly of the family *Hippoboscidae* and is closely related to the mottled cattle fly of Bechuanaland and to several other species which occur on dogs, camels, wild antelopes and birds. It is roughly ¼ inch in length, yellowish brown in colour, the female being slightly larger than the male. The whole insect is flattened from above to below, the head is distinct and bears a long curved proboscis in front which is entirely covered by the palps. The abdomen is sac-like and greyish in colour, but after a meal of blood a reddish tinge becomes evident. The legs are stout and each bears a pair of strong, curved black hooks at the end, and the whole body is covered with yellowish brown hairs.

Life History.—The adult ked, in common with all the members of the family to which it belongs, lays a single egg at a time, which

is not extruded from the body but hatches in the uterus of the mother. The resulting larva is a yellowish oval object incapable of movement, with a pair of breathing pores situated on a dark brown to black slightly raised area at the hind end of the body. When almost ready to pupate, the larva is extruded in the wool to which it is gummed by means of a sticky substance, the situation chosen being towards the sides of the lower surface of the abdomen. After about 12 hours, the outer skin of the larva becomes dark, hard and slightly shrunken and takes the barrel-like shape of the typical pupa. The pupal period lasts about three weeks in summer to 36 days in winter, depending upon the temperature and the distance from the skin of its host. The adult ked emerges from the pupal case after this period and soon commences to feed whilst mating of the sexes occurs after 3 to 4 days. Larvae are deposited by the females in from 13 to 24 days, but, according to American observers, this period may be as long as 30 days after emergence of the adult. During the course of her life, which is roughly four to five months, the adult female ked produces a larva every 10 to 12 days, the total number produced averaging from 12 to 15.

Mode of infection.—As a rule, keds are disseminated amongst sheep by direct contact between infested and clean sheep. The parasites are not capable of moving any appreciable distance on the ground and generally commence dying after a day or two when they drop off their hosts. The longest period that a ked has been kept alive away from its host is 18 days, and this is exceptional. The pupae, however, are capable of hatching away from the sheep provided the temperature is favourable, and although the newly emerged ked is very weak and feeble until it has had a feed of blood, it may infest a sheep if brought into very close contact with it, for example, if a sheep lies down on a fallen lock of wool or on the ground in which newly hatched keds are present.

Symptoms.—Keds are by no means dangerous parasites, but they are responsible for enormous economic loss annually through decreased and inferior wool clips. Infested sheep do not thrive, owing to the continuous draining of blood by the parasites. The bites also cause intense irritation which results in interrupted feeding on the part of the sheep which attempt to allay this irritation by biting and kicking at the affected parts and rubbing themselves against various objects. This results in a ragged looking fleece which, when looked into, is found to contain a large amount of the black granular excretion of the parasites which, in itself, is a source of economic loss as the wool becomes stained and such stains are difficult to remove.

Diagnosis.—It is a comparatively simple matter to discover the presence of the parasites as they are easily seen when the wool is opened. They are generally more numerous at the sides of the body, behind the shoulders, and at the base of the neck. The continual plucking of the wool over the bites of the parasites by the sheep results in locks of wool being drawn out, and gives the animal's fleece a characteristic ragged appearance.

Prevention and Control.—Prevention consists in keeping introduced sheep separate from the clean sheep on the property until the

former have been thoroughly cleaned of any keds which they might harbour. Furthermore, sheep should not be allowed access to any kraal or enclosure in which infested sheep have been kept for a period of one month, as it is possible that pupae, which dropped from such infested sheep, might have hatched, and the resulting adults may set up infection. Experience has taught that veld over which infested sheep have grazed is not a source of danger, because any keds which might drop die very quickly. Keds frequently get on to the shearers at shearing time and may be transported by them to adjacent properties, but as the parasites are relatively large and easily seen, reasonable precautions in looking for and removing them are generally enough. Dipping is the only practical and safe method of eradicating keds from a flock. Extensive tests have been made which have indicated that dips containing arsenic give the most satisfactory results. When arsenite of soda alone is used, three dippings are recommended with an interval of 14 days between each so as to insure that any pupae which might have survived the first or second dipping will hatch and the resulting adults will be killed by the second or third dipping. Combinations of arsenic and sulphur have been found to give even better results than arsenic of soda alone, and proprietary dips of this nature are available in respect of which it is claimed, with justification, that a single dipping is sufficient to kill all stages of the parasite. easily seen, reasonable precautions in looking for and removing them are generally enough. Dipping is the only practical and safe method of eradicating keds from a flock. Extensive tests have been made which have indicated that dips containing arsenic give the most satisfactory results. When arsenite of soda alone is used, three dippings are recommended with an interval of 14 days between each so as to ensure that any pupae which might have survived the first or second dipping will hatch and the resulting adults will be killed by the second or third dipping. Combinations of arsenic and sulphur have been found to give even better results than arsenite of soda alone, and proprietary dips of this nature are available in respect of which it is claimed, with justification, that a single dipping is sufficient to kill all stages of the parasite.

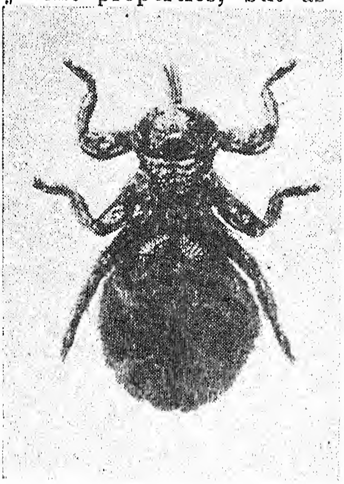

Fig. 1.—The Sheep Ked.

The best time to dip sheep for keds is shortly after shearing when skin wounds have been given a chance to heal, as large numbers of the parasites are removed with the shorn wool and those remaining are more accessible. It is not always advisable, however, to wait until shearing time before dipping, as a great deal of damage to the wool can be caused in the meantime and it is a relatively simple matter to free sheep from keds even though the wool may be long.

Sheep Scab.

Sheep scab is a specific inflammatory condition of the skin caused by the scab mite *Psoroptes communis var. ovis*. It is characterized by the presence of copious exudation which dries into yellowish crusts or scabs, a moderate thickening of the skin, and loss of wool, and it is accompanied by intense irritation.

It is a well-known disease of sheep in many parts of the world, the wool-bearing varieties of sheep being the principal sufferers. In South Africa very determined efforts have been made by the government to eradicate it, but in spite of the fact that eradication is a comparatively simple matter in a flock, the disease still constitutes a menace at times due, firstly, to a tendency on the part of some stock-owners to hide infection and to treat animals individually instead of flocks as a whole, and, secondly, to the difficulty of diagnosing early infections in some cases, particularly in haired sheep.

Description and Life Cycle.—The adult scab mite (Fig. 2) is a minute, pearly-white oval parasite with four pairs of stout legs armed with suckers or bristles or both. The females are considerably larger than the males and measure roughly 1/50th inch in length as opposed to 1/60th inch for the males.

The eggs are laid on the surface of the skin and are very minute oval objects, creamy-white in colour. Hatching occurs in one to three days and the resulting larvae have three pairs of legs, the front two pairs each bearing a sucker at the end of a delicate three-jointed pedicle and the third pair each two long hairs.

Moulting to the nymphal stages takes place in about 12 hours. The nymphs have four pairs of legs, the front three pairs being similar to those of the larvae and the fourth pair bearing a sucker and a long hair. The nymphal stage lasts from 3 to 4 days and a moult then occurs which is followed by the appearance of the males and, in the case of the females, by the pubescent female. This latter stage shows the presence of a genital opening and the fourth pair of legs is armed with two long hairs. In addition, the hind extremity of the body is provided with a pair of prominences which assist in the act of mating, which takes place after a short period of feeding. After the sexes have paired, the pubescent female moults to the egg-laying or ovigerous female which no longer shows the presence of the small copulatory prominences or tubercles at the posterior end of the body. The male is easily recognized by the extreme development of the third pair of legs bearing a sucker in addition to a hair, with the fourth pair smaller and inconspicuous. The whole life cycle is completed in from 8 to 9 days and the eggs of the next generation may be laid on the 9th day after the appearance of the larvae of the preceding generation.

The ovigerous female is able to live on the sheep for periods of 30 to 40 days and during her lifetime may produce almost 100 eggs.

Symptoms.—The initial lesion of scab is usually caused by a limited number of mites or even a single parasite. It commences as a slight reddening of the skin followed by a yellowish swelling which often has a greenish tinge. Clear yellow fluid exudes from the affected area which soon dries into a crust. Extension from

the edges occurs rapidly at first but slows down somewhat as the lesion increases in size, so that the rate of increase becomes roughly an enlargement of total diameter by about one inch per month. Irritation is intense, which causes the sheep to bite or kick at the affected part, depending upon its position and accessibility, and a great deal of wool is lost as a result of interference with its growth

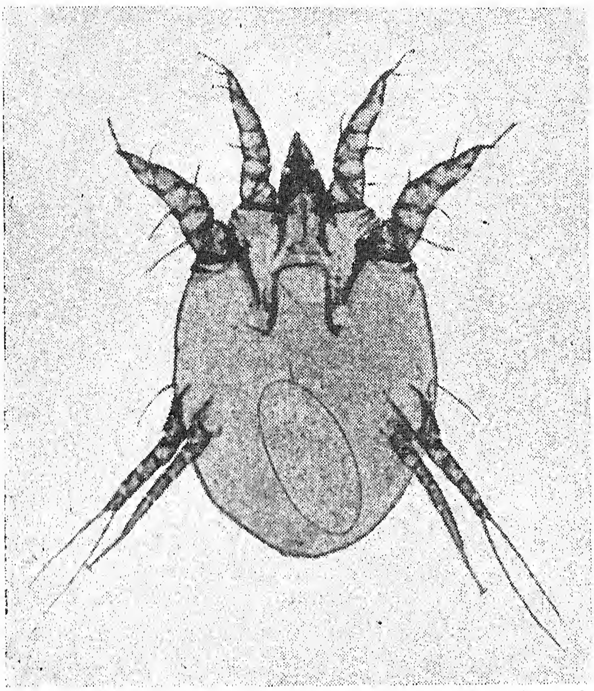

Fig. 2.—Adult Female Scab Mite.

occasioned by the skin inflammation and the rubbing of the skin against various objects. Ultimately a considerable thickening of the skin occurs and its function becomes so impaired that it frequently results in the death of the animal. Some sheep, particularly rams, sometimes show little irritation and the wool is scarcely interfered with, but in such cases the fleece eventually assumes a dry, whitish, lifeless appearance, and the thickened skin, covered by thick dry crusts, can easily be felt when the animal is handled.

The severity of an outbreak of scab together with the rapidity of its spread throughout a flock vary greatly, depending upon such factors as climate, condition of the sheep and the type of sheep involved. Although the scab parasite is specific to sheep only and will not pass on the other animals, woolled sheep show a much greater degree of susceptibility to it than do the haired varieties, and in such sheep as the Afrikaner the disease usually shows a

tendency to become localized to the region of the withers or the fold of skin near the tip of the tail. Cold weather tends to retard spread of the infection provided the condition of the sheep is reasonably good, and cases are cited in European countries of sheep even freeing themselves spontaneously from the infection. As a rule wet weather is deleterious, and this is possible due to the fact that wool yolk, which, if abundant retards development of the parasites, is washed out of the fleece by heavy rain.

Diagnosis.—The scab parasite, although small, is readily visible to the naked eye, and although difficult in finding it is sometimes experienced, especially in mixed and haired sheep or in infections of long standing, the mites are generally abundant at the active edges of lesions. Care must be taken with the cursory examination of a flock for scab not to confuse the lesion at a distance with such skin irritations as ked bites, grass seeds penetrating the skin, especially "steek gras" (Aristida species), so-called Australian itch (a skin condition of unknown origin), lumpy wool [caused by a fungus (Dermatonomus sp.)], etc. Although the chewed appearance of the wool itself is generally characteristic of scab, the animal should be caught and the skin carefully examined for parasites, either with the eye unaided or with the help of a pocket lens. Where doubt exists, skin scrapings should be forwarded to the laboratory for examination.

Mode of infection.—Although the possibility does exist of scab parasites being transported for short distances on clothing, e.g., by shearers, the chances of infection by this means may be regarded as remote and practically all outbreaks are due to direct contact between infected and clean sheep. The scab parasite is not able to exist away from its host for any considerable period, and carefully planned experiments have shown very clearly that kraals, etc., which have harboured extremely heavily infected animals for long periods, are entirely free from infection after the sheep have been removed for a period of 16 days. It has been found, however, that in heavily infected flocks the disease has reappeared 5 to 6 months after dipping which was perhaps not too carefully conducted. The explanation offered for these observations is that the dip was successful in destroying the parasites with the exception of a few which were unable to propagate normally because conditions on the skin were rendered unfavourable and the sheep were given a chance in the meantime to regain condition and increase their natural powers of resistance. Such recurrences generally coincide with the beginning of winter when the veld goes off in feeding value and the sheep again lose condition. Mites are frequently met with in the small pouches situated below the eyes, where they appear to be protected from the dip to some extent by the waxy secretion present there, and this may also account for such recurrences after dipping.

Eradication of Scab.—Dipping constitutes the only reliable method of bringing an outbreak of scab to an end. No amount of hand-dressing of individual sheep will do more than retard the

infection for a greater or lesser period. There are various dipping fluids on the market to-day, but since by far the best results have been obtained by using dips composed of a combination of sulphur and lime, the Department of Agriculture, under the Stock Diseases Act, has stipulated that these dips must be used for the control of scab. Various proprietary brands of lime-sulphur dips are available which, being standardized, give the best results, but a satisfactory dip may be prepared at small cost provided care is taken that the ingredients used are of good-quality. The home-made lime-sulphur dip is prepared as follows:—

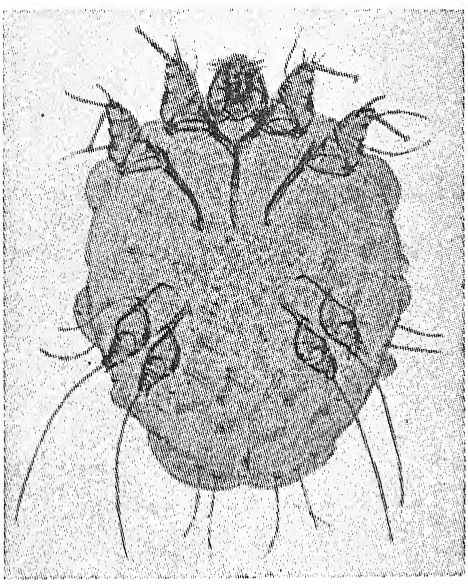

Fig. 3.—Adult Female Mange Mite.

15 lb. of unslaked lime or 20 lb. of slaked lime and 25 lb. of flowers of sulphur or finely ground rock sulphur are thoroughly mixed in 3 to 4 gallons of water. This mixture is then poured into about 25 gallons of water and boiled for 30 to 40 minutes until the liquid has a deep orange colour. The mixture is now removed from the fire and suspended particles allowed to settle out and the fluid is poured into the dipping tank and made up to 100 gallons with cold water.

To be successful, dipping must be carefully conducted. Sheep must be kept in the tank for fully two minutes and during this time the heads should be immersed 3 or 4 times. Where infections are of long standing, it is advisable to shear old cases, and hard crusts on the skin should be softened by rubbing with a brush or other object, using a small quantity of the dipping fluid for the purpose.

The small pouches below the eyes and the insides of the ears should also receive attention and may be dressed with the dipping fluid or with a mixture of 1 part paraffin and 2 parts oil.

Dipping should be repeated after an interval of 8 to 10 days to ensure the destruction of any parasites which may have hatched from eggs not destroyed by the first dipping, and, should a third dipping be deemed necessary, this should be applied 8 to 10 days after the second one.

It must be borne in mind that sheep scab is a scheduled disease under the Stock Diseases Act, and it is the duty of every owner to report an outbreak of the disease to the nearest stock inspector, government veterinary officer or other local authority.

Mange in Sheep.

Mange is a disease which plays a very small part in so far as Merino sheep are concerned, but it is occasionally met with in haired sheep. It is a chronic, deep-seated inflammation of the skin accompanied by intense irritation and caused by the mange mite, *Sarcoptes scabiei.* In contradistinction to the scab mite, the mange parasite is not specific and, although not always easily transferable from one species of animal to another, it may set up the condition in goats, horses, cattle, pigs, dogs, etc., whilst even the human being is susceptible. The lesion is characterized by enormous thickening of the skin, which is thrown into folds, showing the typical dryness and cracking with the loss of hair over the affected parts. Exudate is limited, as a rule, but in some cases may be fairly copious, drying into hard, yellowish crusts often accompanied with a small amount of bleeding.

Description of Parasite.—The mange mite (Fig. 3) is considerably smaller than the scab mite, and although it is visible to the naked eye when placed on a suitable dark background, it is almost impossible to find it on the animal in the course of an ordinary examination. It is more or less circular in shape, whitish in colour, and on the upper surface of the female are a number of conical triangular prominences. The legs are short and thick, and do not extend much beyond the margins of the body. The front two pairs of legs are each provided with a sucker, which is carried on the end of a short, unjointed stalk. The hind two pairs of legs are short and do not project beyond the edges of the body. In the female they are provided with bristles.

Life Cycle.—The female sarcopt burrows into the skin in which she makes small, twisted tunnels. The eggs are laid at the end of the tunnel where they hatch in about 5 days. The larvae which emerge, moult three times, after which the nymphs appear. These are of different sizes, the smaller becoming males and the larger pubescent females after the next moult. The males do not moult again, but another change occurs before the females become sexually mature. The life cycle has not been determined quite as accurately as is the case with that of the scab mite, but it is apparently completed within about the same time.

The mange mite has been shown to be unable to live away from its host for longer than 16 days, so that kraals, sleeping places, etc., previously occupied by infected animals, are incapable of reinfecting a flock of sheep if they are kept free from sheep for a period of 16 days.

Prevention and Control.—As previously mentioned, the mange mite, in contradistinction to the scab mite, is capable of setting up the infection in a variety of animals including man. This fact must not be lost sight of, for failure to cleanse other domestic animals such as goats, pigs, horses, etc., can very easily lead to reinfection of the flock should it come into contact with such other animals.

Treatment consists of dipping all the infected and in-contact animals. Lime-sulphur dip, similar to that used for scab, is recommended as being the most effective, and the procedure adopted

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Toe-pecking, Feather-eating and Cannibalism in Fowls.

J. A. van der Merwe, Assistant Professional Officer (Poultry), Grootfontein College of Agriculture, Middelburg, C.P.

CANNIBALISM is one of the most common difficulties encountered in the successful treatment and raising of chickens and if the poultry farmer fails to act promptly and drastically, the raising of chickens may present a difficult problem. This evil annually causes a considerable loss of chickens and hens.

Cannibalism, in its elementary form, originates as the secondary result of toe-pecking and feather-eating in chickens and hens, which is caused by the absence of an indispensable factor or of a complex of interrelated factors.

It is an evil which is not confined to chickens and young stock, even the best types of hens at times falling a victim to it. It often happens that the muscles of the oviduct of a high-producing hen become paralysed for some reason, with the result that this organ partially protrudes from the vent. The bloody and flesh-coloured appearance of the oviduct is very attractive to other hens, with the result that when one starts pecking at it, she is soon followed by others until finally all the birds participate. Unless the unfortunate victim is removed, her internal organs are eaten out in the most pitiable manner. Once hens have developed a taste for blood, it rapidly develops into an insatiable lust of which it is very difficult to break them.

Cause of this Phenomenon.

Keeping fowls in closely confined or limited spaces has given rise to new problems which did not exist when fowls could run free and could supplement their diet at random and in a natural way with insects and greens.

Because of the nature and complexity of this phenomenon, its cause is not always readily ascertained. It does not arise as a spontaneous or hostile tendency, but is a natural and instinctive reaction intended to satisfy some cardinal deficiency. The primary cause is usually a nutritional deficiency which leads progressively through other interrelated factors and faulty circumstances, to the development of the worst form of cannibalism.

The lack of an essential constituent in the feed, for example, and the crowding of chickens into a limited space will favour and hasten the occurrence of cannibalism.

Prevention, Control and Treatment.

In most cases this evil is the result of incorrect feeding and management. Unbalanced rations, lacking in certain essential nutritive requirements of the growing and producing bird, inevitably lead to toe-pecking and feather-eating.

A shortage of certain kinds of feed makes it difficult to give the birds fully adequate rations all the time, and breeders must therefore be on their guard against these evils. Proteins, especially, play an important rôle here. The various indispensable amino acids must be provided in quantity as well as in quality. Feathers contain a high percentage of sulphur, and the sulphur-containing amino acids such as Methionine and Cystine, are, therefore particularly important for encouraging rapid growth of feathers in order that the body may be speedily covered, since young unfolding feathers are less attractive to other fowls.

By making use of various sources of protein such as meat-meal, fishmeal, crayfish-meal, soybean-meal and peanut-meal and by combining them according to price and availability, the danger of a shortage of amino acid can be largely eliminated.

The crude fibre content is important in making up a complete ration—for chickens it should constitute 5 per cent. to 7 per cent. and for laying hens 5 per cent. to 6 per cent. of the ration. The fibre is highly absorbent, with the result that water is retained in the alimentary canal in a semi-fluid mass of food, which produces a condition and sensation of fullness and satiation thereby mechanically preventing cannibalistic tendencies.

Other important constituents of fowl feed are the rare mineral elements, of which manganese, by far the most important, is well represented in bran and oatmeal. It would appear that a deficiency of manganese gives rise to cannabilistic tendencies and urges. Manganese can be provided by adding from 6 to 7 gm. of manganese sulphate powder to every 10 lb. of feed and then thoroughly mixing it with 90 lb. of mash. Approximately 4 to 6 ounces of $MnSO4$ per ton of feed provide adequately for the requirements of chickens. Provision should also be made for a regular supply of feed and for sufficient feeding space, to prevent jostling and trampling. Ten square feet of feeding space must be provided per 100 day-old chicks and double that area when they are 8 weeks old.

Another important cause of these evils is the practice of keeping large numbers of fowls in confined spaces. Under such conditions there is little scope for movement, exercise and the natural activity of the bird; consequently the weaker ones are jostled aside and usually become the first victims of cannibalism. On account of the limited scope for movement, the injured fowl cannot evade its pursuers and thus falls a prey to them. It is surprising how quick chickens are to notice blood, especially on breeds with white feathers where it shows up very clearly, and how quickly they develop a taste for blood.

This evil is a habit of very rapid growth, and once acquired, is difficult to eradicate. In this case, too, prevention is better than cure. The most important measures for prevention are the feeding of complete rations and the provision of adequate housing space. Another preventative measure where chickens are kept intensively or in battery brooders, is to diffuse the light by hanging red curtains in front of the windows. The pale red light in the room makes it difficult to discern the wounds.

Also keep the chickens busy by hanging green lucerne from the roof. They jump for the lucerne and in this way their attention

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Hygienic Measures for Stock-Watering Dams.

J. J. O. Pazzi, Soil Erosion Engineer, Division of Soil and Veld Conservation.

ON some farms there are still to be found stock-watering dams and drinking pools, which, instead of being a boon to the farmer, are actually a curse since their existence is not only a menace to man and beast but, to put the matter briefly, a handicap to the smooth running and efficient organization of the whole farming enterprise.

An inspection of such watering-dams will reveal innumerable small depressions made by the hoofs of cattle all round the waterline. These are usually full of water, the temperature of which is just right for the puddles to serve as ideal breeding places for a host of animal parasites. In the dam itself, tadpoles and small fry continually prey upon these, but they cannot reach the isolated puddles made by the hoofs of the cattle, with the result that the parasites reach maturity, and achieve their purpose, each being responsible for the propagation of thousands of its species. After good rains, when the farmer most urgently requires his labourers for ploughing operations, he is often disappointed to find that they are nil. In the malarial areas this may be due to mosquitoes which hatched in the puddles and transmitted the disease to the labourers.

Infection of Stock.

Now turn to the belt of shallow water which laps against the margin of the dam. Not only is this a death-trap for weak or sickly sheep which get stuck in the mud and are drowned, but it is also a constant source of germ infection for stock. Where conditions such as these exist on a farm, large sums of money are spent and many working hours lost every year in an attempt to rid the animals of parasites and disease. The poor animal is certainly not to be blamed for contracting diseases; it is the farmer's negligence which is usually responsible for this state of affairs.

The veld is generally dotted with the droppings of animals and until this dung is almost completely decomposed, animals will not graze in its immediate vicinity, despite the fact that the grass growing round such manure is exceptionally attractive. Instinct warns the animals against the danger of germs present in such excretions. But what do we find in the case of stock-watering dams? Here the water is contaminated with animal excretions and stock have no choice but to drink the germ-infected water. Not only does warm shallow water teem with myriads of parasites, but it is also extremely likely to harbour the eggs of the measle tapeworm and liverfluke, as well as anthrax germs, etc. Certain germs can survive for as long as 7 years in moist soil. Consequently every accessible

stock-watering dam constitutes a potential source of danger of the first magnitude, and plays a considerable, if not decisive, rôle in hampering successful farming.

Measures to be Taken.

By eliminating this constant source of danger, the farmer will be able to avoid losses of stock, expenditure on medicines and loss of time, etc.—debit items which in the long run would represent a very considerable sum of money.

To remedy this unsatisfactory state of affairs is such a simple matter that the measures to be taken may be stated in a few sentences. First fence in the entire dam so that animals cannot gain access to it, and then conduct the water by means of pipes to a suitable place below the dam. There a strong drinking trough should be constructed and provided with a ball valve which will automatically control the level of the water in the trough and prevent overflowing, which would only result in the formation of a fresh quagmire round the trough. Where the wall has already been provided with a pipe, it will merely be necessary to insert a T-piece between the pipe and the valve. The pipe leading to the trough is then screwed into the T-piece. Second-hand piping laid at a depth of approximately one foot will be quite suitable since the pressure of the water will be low.

Full hygienic use of the reservoir can be obtained only if it is connected to a drinking trough fitted with a ball valve.

In order to destroy mosquito larvae a few drops of paraffin should be poured on the surface of the water every week.

A reservoir should be so situated that the water can be conducted to several drinking troughs, one for each paddock.

Toe-pecking, Feather-eating and Cannibalism in Fowls.

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is diverted from one another. It is also believed that ground oats in the rations have a preventative effect.

Chickens of different breeds, ages and sizes should not be kept together in the same brooder or pen. The lighter breeds moult more rapidly and they are inclined to peck the heavy, slower-moulting breeds such as the Black Austrolops.

All injured birds should be removed immediately and the wounds treated with iodine or coal-tar. It is best to isolate such cases until they have recovered. Where the habit has already been formed in a flock, more space must immediately be provided.

Cannibalistic tendencies in older fowls can easily be suppressed by carrying out all the above measures and by feeding them weekly on approximately 3 lb. of raw minced meat (scraps) mixed with the mash, per 100 hens.

The observant poultry farmer will quickly detect cannibalistic tendencies in his flock and will combat them in good time.

Mould Control in Grapes.

Results obtained with the Use of Sulphur Dioxide.

Dr. I. Donen, University of Cape Town.

THE war has forced the table-grape producers to study local markets. Here they have to contend not only with problems of distribution and packing but also with mould infection in grapes which have to travel long distances at high temperatures. High incidence of mould obviously means short selling life and low prices, and is also the limiting factor in the delivery of grapes to markets on this continent outside the Union.

Treatment of grapes with sulphur dioxide to retard mould growth has been the accepted practice in Californian districts for a number of years (1, 4, 5, 6). Treatment may be carried out in two ways: Either by fumigating the grapes in trucks or special rooms, or by including ready sources of sulphur dioxide such as sodium acid sulphite or metabisulphite with each package of grapes. Sometimes both metods are combined. However, certain difficulties and dangers are associated with the use of sulphur dioxide. Overdosage may completely ruin a consignment of fruit, varieties differ in their susceptibility to gas injury, whilst maturity of the fruit and temperature of treatment are also important variables. Preliminary tests on our local varieties are therefore essential.

In this country considerable work has been done on the use of sulphite tablets which offer considerable promise (7). A few experiments have been done on the gas treatment of Henab Turki, Hanepoot and Gros Colman (2, 3), but these results were not promising, largely because of the high susceptibility of these varieties to gas injury, and posibly due to overdosage. Almost all tests with sulphite tablets were confined to the above varieties and exclusively to export conditions which include cold-storage treatment of the grapes. As far as the writer is aware, no tests had been carried out in this country on grapes stored at high temperature only, i.e. under conditions imitative of local markets. The problem here is to achieve control of mould development during the first twenty four hours after picking, for, once mould infection has established itself, even severe fungicidal treatment appears to be ineffective. Sulphurdioxide gas seemed eminently suitable for the problem and accordingly some tests were carried out last season with Waltham Cross, Barlinka, Emperor and Almeria grapes. Since the first two varieties are the most important in this country. and since little is known of the resistance of all these varieties to sulphur-dioxide injury, it is hoped that these tests might be of considerable general interest.

Experimental Work.

The grapes for these tests were wrapped in paper and packed with woodwool in 5½ in. or 4½ in. 10 lb. boxes. The fruit was

gassed immediately after packing in a 2 ft. 6 in. by 3 ft. 6 in. gas-tight wooden chamber. The requisite amount of sulphur-dioxide gas was added from a weighed cylinder of liquid sulphur-dioxide.* A circulating fan assured uniform mixing and distribution of the gas in the chamber, which could take 24 boxes of fruit. The volume of gas required to give the necessary concentration was calculated from the known volume of the chamber and by taking 30 per cent. of the volume of the fruit boxes as "free volume".

TABLE I.—*Effect of Sulphur-Dioxide Fumigation on Mould Development in Barlinka and Waltham Cross Grapes.*

Fruit gassed with 2 per cent. sulphur dioxide for 30 minutes at 68° F. 5 Boxes of grapes as unit of treatment. At P = ·05 significant differences between treatment totals = 39 berries Sol. Sol./Acid Ratios :—

Barlinka........................ 19·5/0·58 = 33·6.
Waltham....................... 22·6/0·48 = 47·3.

Treatment.	Barlinka.		Waltham Cross.	
	Mould in berries.	Percentage green stalk.	Mould in berries.	Percentage green stalk.
		%		%
A. Control	169	44	126	0
B. SO_2 before packing	72	96	56	70
C. Sulphite tablets	49	55	60	36
D. SO_2 sulphite tablets	0	100	23	87
E. SO_2 after packing	8	90	22	90

Mould was expressed as the number of berries showing definite mould per five boxes of fruit. As a general guide, 40 berries in five 10 lb. boxes of grapes represent roughly 1 per cent. mould infection. The term "mould" embraces all forms of fungal rot encountered in grapes.

Commercial Life of Untreated Grapes.

It is well realized that the appearance and value of grapes may occasionally be ruined by a few badly infected berries, whilst grapes with considerable infection in its early stages may pass as commercially sound. Nevertheless, there is in general a definite relationship between the number of infected berries and the commercial value of grapes, and it may be used as a measure of quality. This has been done in this study. The permissible level of wastage in good grapes has been taken as 40 berries in 5 boxes. The estimate is based on the amount of wastage found to be present in grapes on their arrival in Johannesburg and pronounced by the sales agent to be in a first-class condition. The limit of infection which renders grapes commercially valueless was taken as 120 berries per five boxes. On opening a box of grapes at this level of infection

* At ordinary conditions of temperature and pressure 1 lb. of sulphur dioxide has a volume of very nearly 6 cub. ft.

few bunches were found to be free from mould and most of the fruit was quite unattractive.

The length of the commercial life of untreated grapes may be judged from the results shown in Figs. 1 and 2. These were obtained by observing mould in grapes stored in the laboratory at 65° F. The results show that for these consignments Almeria grapes had a commercial life of 12 days, Barlinka 7, and Emperor 6 days. Since it takes four days from the Cape vineyards to reach the retailers

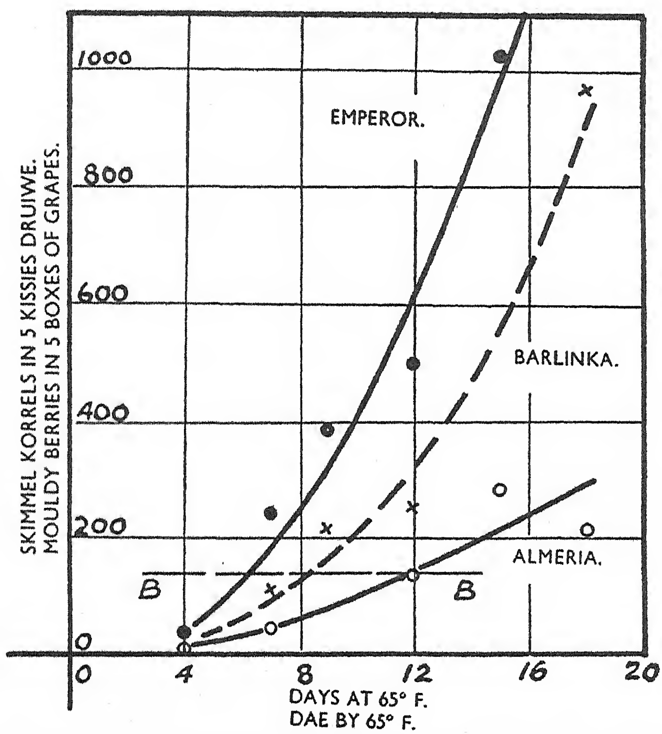

Fig. 1.—Rate of development of mould in three varieties of untreated grapes stored at 65° F. B-B shows limit of commercial life. Fruit from De Doorns. Picked on 12th May, 1940.

in markets in Johannesburg and Pretoria, the selling life of these grapes cannot be considered very satisfactory.

Tests with Sulphur Dioxide.

The first test was carried out on Waltham and Barlinka grapes picked at Somerset West on 24th March. Five treatments were given as shown in Table 1. Fruit in Treatment B was gassed before, and in E after packing. A 0·25 gm. tablet of sodium acid sulphite was enclosed with each bunch in C, whilst the D-fruit received tablets as well as a fumigation before packing.* The gassing was done in the packhouse, where the fruit was left for seven days and then

examined. The results were analysed statistically. All treatments led to a significant reduction of mould infection, but gassing the packed fruit gave the best results. The gas treatment markedly affected the appearance of the stems, which remained fresh and yellow-green, in contrast with the controls, which were mostly brown and dry. Only the D-fruit showed some bleaching of the stalk and slight discoloration in a few berries.

TABLE II.—*Effect of Sulphur-Dioxide on Mould Development in Barlinka Grapes.*

Dosage: 2 per cent. sulphur dioxide for 35 minutes.
Observations made 7 days after treatment.
Results—per 5 boxes of grapes. Fruit picked 1 April, 1941.

Consignment.	Control.		Treated with SO_2.	
	Mould in berries.	Percentage green stalk.	Mould in berries.	Percentage green stalk.
		%		%
A.	227	19	25	82
B.	252	61	116	66

The second test consisted of a comparison of mould development in gassed and untreated Barlinka grapes. Five boxes were used as a unit for each observation and the results are given in Fig. 2. The maximum level of permissible wastage is indicated, and it is apparent that gas treatment gave the grapes 8 days of extra commercial life. The effect of sulphur dioxide is, apparently, only to delay the onset of mould attack, for after nineteen days the two curves of wastage meet. Slight injury was observed in the treated grapes on the 14th day of storage at 68° F., but it was confined to a few isolated berries, and the flavour of the grapes was in no way affected. Some of the experimental grapes were given 21 days' cold storage. As shown in Fig. 2 these grapes showed relatively little wastage when examined 7 days after removal from store, and this is indicative of the aid given by low temperature in controlling mould development. However, the effect of sulphur dioxide was noticeable in these grapes as well.

Meanwhile 50 boxes of Barlinka were taken from each two farms at Somerset West, and after gassing half of each consignment, the grapes were dispatched to an agent in Johannesburg. Here the treated and untreated grapes were offered for sale as separate consignments, but the agent was not informed which were the treated grapes. His report was much in favour of the gassed grapes, which were so much better than the controls that the difference was

* These tablets were kindly provided by Dr. J. E. van der Plank, lately of the Low Temperature Laboratory, Cape Town.

noticed on the market and they realized 3d. more per box than the untreated grapes. The latter sold at 2s. 3d. per box. The agent's personal opinion was that the difference in price should have been 6d. per box.

Twenty boxes of these experimental grapes were examined for mould by Dr. F. G. Anderssen, of Pretoria. Similar observations were made on corresponding fruit in Cape Town: The combined results given in Table II again indicate the efficiency of sulphur-dioxide treatment. No sulphur-dioxide injury was reported.

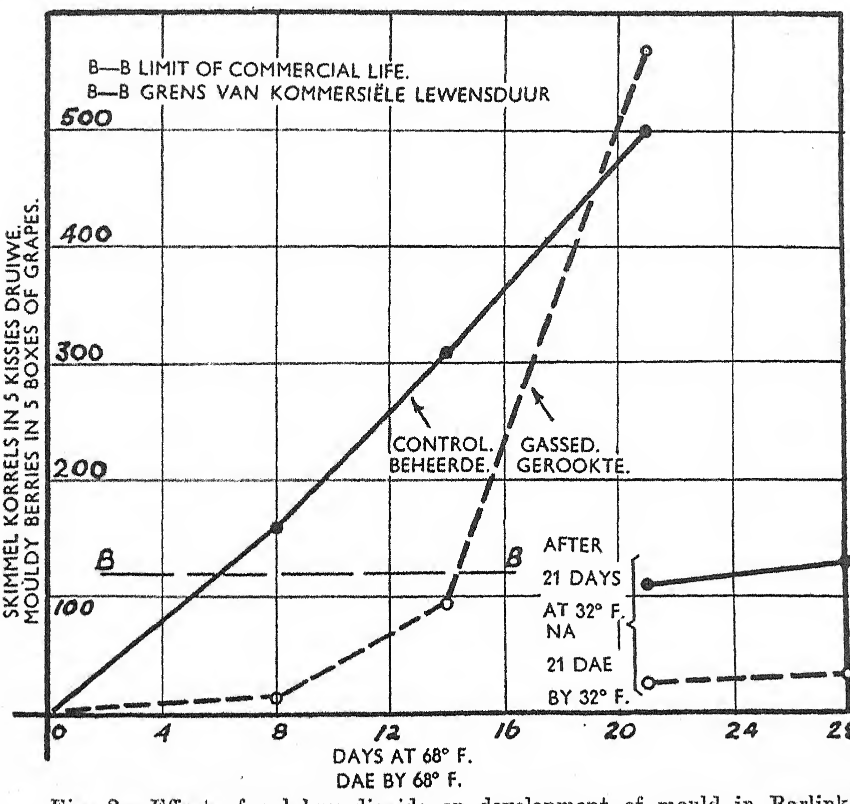

Fig. 2.—Effect of sulphur dioxide on development of mould in Barlinka grapes stored at 68° F. Dose: 2 per cent. gas for 30 min. at 68° F. Grapes from Somerset West. Picked on 8th April, 1940.

This type of commercial test was repeated on May 12th with a total of 198 boxes of three varieties of grapes—Emperor, Barlinka and Almeria—from De Doorns. The fruit was offered for sale in Johannesburg and the treated fruit realized 3s. per box for Barlinka and Emperor and 2s. 6d. per box for Almeria. The agent again emphasized the better appearance of the treated fruit and indicated that they were worth 6d. more per box than the controls. In this test the controls formed only 25 per cent. of the total consignment, and the agent reported that " since there was only a small quantity of

each variety I managed to push these to the buyers at the same price as the treated grapes ".

Examinations for mould were made on representative samples on the arrival of the grapes in Johannesburg (four days after picking). A similar examination was made seven days after picking on corresponding samples kept back in Cape Town. The results given in Table III show that, although gassed fruit had less mould than the controls on the fourth day, the differences were not significant. On the 7th day, however, Barlinka and Emperor controls showed

TABLE III.—*Effect of Sulphur-Dioxide on Mould Development in Almeria, Barlinka and Red Emperor Grapes.*

Dosage: 2 per cent. sulphur dioxide for 20 minutes.
For P = 0·5 significant difference between treatment totals = 47.

Variety.	After 4 days at 65° F. Mould in 5 boxes.		After 7 days at 65° F. Mould in 5 boxes.	
	Control.	Treated.	Control.	Treated.
Almeria	9	5	44	5
Barlinka	22	3	110	55
Emperor	33	9	241	22

significantly greater amounts of mould infection than the gassed fruit. Almeria grapes were not very susceptible to mould infection, which was low even in the controls. Again no sulphur-dioxide injury was reported.

Sulphur-Dioxide Injury.

As has been indicated, very little sulphur-dioxide injury was observed in the above tests. The injury usually occurred at the capstem end and was indicated by the collapse of the flesh, which led to a depression at the end of the berry. This injury was never in a severe form and was difficult to detect unless specially looked for. It did not affect the flavour of the fruit to any extent and was of no commercial importance.

To test the effect of gas concentration on the development of such injury, samples of Emperor, Barlinka and Almeria grapes were treated with 0·4, 0·8, 2·0 and 4·0 per cent. sulphur dioxide for 30 minutes at 65° F., stored at that temperature, and examined at regular intervals. The experiment was a composite one and originally designed to test the effect of gas concentration on wastage as well. The fruit for this test was gassed four days after picking. The results for wastage, given in Table IV, show a general tendency for the gas-treated fruit to have less mould. The results are not consistent, however, and statistically not significant. Since the fruit was the same as that used to obtain the results reflected in Table III, this suggests that, for effective control of mould under local conditions, gassing should be done as soon as possible after picking and packing.

The extent of injury observed in these experiments is also shown in Table IV. The results indicate that 2 per cent. and 4 per cent. sulphur dioxide produce visible injury after 10 days' storage. Injury was extensive only in Emperor grapes treated with 4 per cent. gas.

Amount of Sulphur-Dioxide Injury.

It is clear from the foregoing that the Waltham, Barlinka, Emperor and Almeria grapes in these tests showed considerable resistance to sulphur-dioxide injury. The susceptibility of any

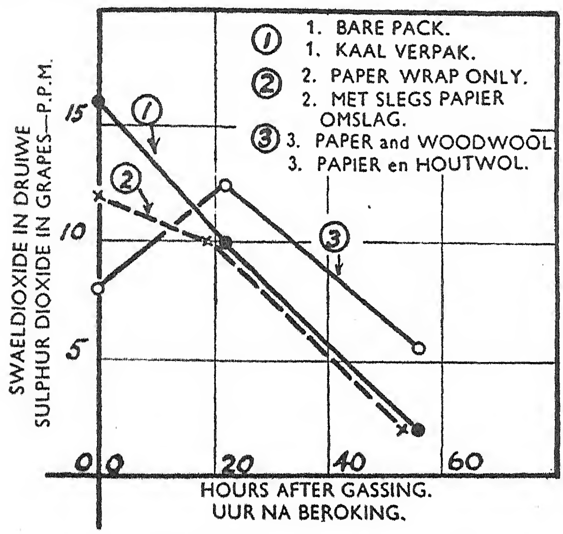

Fig. 3.—Rate of loss of sulphur dioxide from Barlinka grapes packed in different types of packing.

(1) No paper or woodwool.
(2) Fruit wrapped in paper, but no woodwool.
(3) Fruit wrapped in paper and woodwool between bunches.

variety to injury is probably connected with the avidity with which the grapes take up sulphur dioxide. Analysis of grapes immediately after treatment may, therefore be used as a guide to the possibility of injury—20 ppm. has been suggested as generally safe for American varieties(5). As seen in Table V, similar analysis done on the grapes used in this study shows that the maximum absorption occurred in the Emperor grapes, which, after gassing for 30 minutes at 59° F. with 2 per cent. gas, absorbed 14 ppm.* Barlinka only absorbed 10 ppm. However, the amount of sulphur dioxide taken up by the grapes is dependent upon several factors, such as gas concentration, length of time of treatment, and temperature. No data for the latter variable were obtained in these tests.

* Sulphur-dioxide in the fruit was estimated by Monier—Williams' method. After distilling the sulphur-dioxide into hydrogen peroxide, the resulting sulphates were estimated nephelometrically (8). Absorption of sulphur-dioxide in iodine was originally tried but the method was found quite unreliable for small quantities of sulphur-dioxide.

The efficacy of small concentrations of sulphur dioxide in controlling mould is readily explained by the results in Table VI, which clearly indicate that all the sulphur dioxide absorbed by the fruit is concenerated in the skin. These results greatly emphasize the effect of concentration and variety and offer an interesting explanation of varietal differences in susceptibility to gas injury.

Since most of the absorbed gas is concentrated in the skin of the grape, its ready loss from the fruit is to be expected. Fig. 3

TABLE IV.—*Sulphur-Dioxide Injury and Wastage in Gassed Grapes.*

Number of berries showing injury—I, wastage—W. Unit, five boxes.

Gas concentration.	Waste in Control.	0·4 percentage.		0·8 percentage.		2·0 percentage.		4·0 percentage.	
		I.	W.	I.	W.	I.	W.	I.	W.
Almeria—									
Days after gassing—									
7...........	50	0	20	0	30	0	10	0	60
10...........	320	0	40	0	40	0	200	1	50
13...........	215	0	395	0	195	3	35	16	80
16...........	160	0	560	0	55	6	50	11	245
Barlinka—									
Days after gassing—									
7...........	330	0	35	0	125	0	245	0	335
10...........	465	0	130	0	115	10	355	15	190
13...........	300	0	215	0	65	19	215	19	90
16...........	415	0	1,865	6	735	7	1,765	26	65
Emperor—									
Days after gassing—									
7...........	390	0	175	0	240	0	980	0	135
10...........	825	0	420	0	785	7	275	73	195
13...........	890	0	425	5	1,340	6	1,820	122	665
16...........	1,855	0	1,070	4	1,640	7	600	7*	2,375

* Extensive wastage prevented accurate observation of sulphur-dioxide injury.

indicates that in the Barlinka most of the sulphur dioxide was lost in 48 hours, and after three days none could be detected. When offered for sale to the public the fruit is, therefore, quite free from gas. The presence of woodwool affects the rate of loss of gas from the grapes, presumably due to absorption of sulphur dioxide by the woodwool during treatment. Wrapping bunches in ordinary paper has no effect.

Conclusion.

During the course of this study close on 500 boxes of grapes, of which 300 were treated with sulphur dioxide, were tested. The results definitely indicate that treatment with this gas offers a very

promising method of increasing the selling life of non-refrigerated fruit sent to African markets. Admittedly the results are only preliminary and further exhaustive tests, especially on varietal susceptibility (e.g. Hanepoot) are required; in addition, the rival claims of sulphite tablets are to be considered. Nevertheless it may be stated that sulphur dioxide has many advantages: it is eminently

TABLE V.—*Effect of Concentration of Gas and of Time of Gassing on Amount of Sulphur-Dioxide absorbed by Grapes. Gassed at* 59° F.

(*a*) *Effect of Concentration.*

Gas concentration.	1 Per Cent.	2 Per Cent.	4 Per Cent.
Variety—	ppm.	ppm.	ppm.
Almeria	2	4	9
Barlinka	3	10	19
Emperor	5	14	34

(*b*) *Effect of Time.*

Dosage: 2 per cent. sulphur-dioxide.

Variety.	Time. 10 Min.	20 Min.	30 Min.
	ppm.	ppm.	ppm.
Almeria	3	3	4
Barlinka	3	3	10
Emperor	3	4	14

TABLE *VI.—Distribution of Sulphur-Dioxide in Different Parts of the Grape. Gassed at* 59° F. *for* 30 *minutes.*

(*a*) *Effect of Concentration.*

Variety: Barlinka. Sol. Solids: 19·8 per cent.

Gas concentration by Vol.	1 Per Cent.	2 Per Cent.	4 Per Cent.
	Percentage.	Percentage.	Percentage.
Percentage Skin	11·2	14·0	13·3
Percentage Flesh	88·8	86·0	86·7
	ppm.	ppm.	ppm.
(1) SO_2 in skin	14	44	67
(2) SO_2 in flesh	2	4	7
SO_2 in whole berry	3	10	19
SO_2 in whole berry calculated from (1) and (2)	3	9·5	15

(b) *Effect of Variety.*

Dosage: 2 per cent. sulphur dioxide for 30 minutes.
Sol. solids: Almeria, 21·7 per cent. Emperor, 18·5 per cent. Barlinka, 19·8 per cent.

Variety.	Almeria.	Barlinka.	Emperor.
	Percentage.	Percentage.	Percentage.
Percentage Skin..........................	19·2	14·0	14·0
Percentage Flesh..........................	80·8	86·0	86·0
	ppm.	ppm.	ppm.
(1) SO_2 in skin..........................	20	44	72
(2) SO_2 in flesh..........................	0	4	4
SO_2 in whole berry....................	4	10	14
SO_2 in whole berry calculated from (1) and (2)	4	9·5	13·5

suitable for mass treatment in which concentration and time can be rigidly controlled, and it can be applied to fruit in any container. The cost of gas and extra handling required should be well under ½d. per box of fruit. The disadvantage of the method is the fact that a special chamber is required for the purpose. A commercial unit being built at Somerset West to take 50 by 5½ in. boxes, or 80 by 3½ in. boxes, or 15 by 50 lb. baskets of grapes per treatment measures 3 ft. 6 in. by 3 ft. 4 in. by 6 ft., and is estimated to cost about £10. To this must be added the cost of the fan. However, this outlay, when reckoned over a period of years, is negligible.

ACKNOWLEDGMENTS.

The author is indebted to Mr. K. B. Quinan, Somerset West, for facilities in his packhouse and for supplying grapes for some of the tests. Thanks are also due to Lourensford Estate and the Deciduous Fruit Board for the supply of fruit. The latter also contributed towards the cost of the commercial consignments to Johannesburg and the cost of the experimental chamber.

The author is further indebted to Dr. F. G. Anderssen, Chief of the Division of Horticulture, and to Mr. G. E. Taylor, of Johannesburg, for their assistance in inspecting the test consignments in Johannesburg.

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Eradication of Acacia Scrub and Trees.

Dr. R. A. Dyer, Division of Botany and Plant Pathology.

IN *Farming in South Africa*, March 1930 a method of control of scrub bush was discussed. It was recommended that the scrub should be cut down 2 to 3 inches above ground in the late summer or autumn and that the cut stems should be painted with a solution of arsenite of soda (1·5-2 lb. per gallon water, using an old paint brush and avoiding careless handling of the poison).

Later tests showed that the substitution of arsenic pentoxide (1 lb. per gallon water in the place of arsenite of soda) gave a greater measure of success. This was referred too in *Farming in South Africa*, February 1931. The main objection levelled at these methods is the use of the highly poisonous arsenical compounds. No farmer who has followed carefully the advice given has voiced any adverse criticism on this point to the writer, however, and it is known that it has been of value to many. An unsolicited expression of appreciation came recently from Mr. John McCallum, Tzaneen, who had used the arsenic pentoxide method with marked success.

Mr. McCallum, however, considered that the poison could be applied more economically by using a somewhat weaker solution in a small spray pump such as used for the household control of insects. Further, he preferred to cut the stumps as low as possible into the ground. Mr. McCallum had a further helpful suggestion, namely, that the arsenic pentoxide solution should be given a distinctive colour (any soluble colouring matter which would not clog the spray nozzle) so that there should be no doubt as to where the poison had been applied.

Unfortunately the writer has had no opportunity of continuing with poisoning tests and except for emphasizing the need for due care in applying the poison and the importance of the time of year to the success of the control measures, nothing further can be added, from personal experience, to that set out in the articles mentioned above.

Other workers (*Farming in South Africa*, November 1940) have claimed promising results from the use eof paraffin or power paraffin and this method may appeal to those farmers who have a rooted objection to the use of arsenical compounds.

If a farmer takes the trouble, by one means or another, to eradicate unwanted scrub bush, he should take particular care that his subsequent management of the veld does not encourage a repetition of the evil condition.

Anthracnose of Vines and its Control in South Africa.

IN this bulletin [Science Bulletin No. 216 by S. J. du Plessis, D.Sc. (Agric.), Stellenbosch] a detailed description is given of the symptoms of anthracnose as they appear on the shoots, leaves, stalks, and berries of vines.

The causal organsim (*Gloeosporium ampelophagum*) is described in all its stages and the importance of the resisting fungus growth in the infected spots for the propagation of the causal fungus as also the control of the disease is indicated.

Anthracnose has been found to occur practically throughout the winter-rainfall area of the Cape Province and during the past season has caused serious damage, especially in the districts of Robertson and Swellendam. Rain, especially at relatively short intervals, is favourable for the spread of the disease. In such cases the actual precipitation need not be exceptionally high in order to induce an epidemic incidence of the disease. Grape varieties, however, show considerable variation as regards their susceptibility to this disease and a detailed table is given of the relative susceptibility of the different varieties.

The bulletin deals mainly with the method and the results of experiments conducted in connexion with the control of the disease over a period of three seasons. The results were particularly convincing in respect of the value of a winter spray with sulphuric acid, lime-sulphur or copper sulphate. The two last-mentioned were somewhat less effective than sulphuric acid, but the difference does not justify the recommendation of sulphuric acid in preference to lime-sulphur or copper sulphate.

Further experiments have shown that the efficiency of lime-sulphur against the disease diminishes when the concentration is reduced from 1 in 8 to 1 in 20; but even the latter solution was sufficient to reduce the disease very markedly. If copper sulphate is used, however, in a concentration weaker than 1 lb. to 2 gallons of water, very poor control of the disease is obtained.

By means of an evaluation it was determined that winter spraying is the most important treatment in the control of the disease. The summer treatments, given at three different stages, however, are valuable supplements to the winter spraying and ensure healthy vines and peak crops.

Summer treatments without previous winter treatments were, however, inadequate for reducing the disease to a satisfactory level.

Summer treatments with Bordeaux mixture, copper-sulphur dust, Verderame, Verderame-sulphur dust, "Perenox" or basic copper sulphate all proved effective against the disease, but a

 [Continued on page 212.

Farm Refuse may Cause a Starvation Period in Soil.

M. M. Walters, Chemical Officer, College of Agriculture, Grootfontein, Middelburg, C.P.

THE decomposition of farm refuse, such as straw, chaff, leaves, manure, etc., in dumps and in the ground is caused by organisms in order to obtain for themselves nitrogen as body-building matter, and carbon for both energy and body-building purposes. The larger the amount of easily decomposed carbon compounds present in the refuse, the more rapidly these organisms increase in numbers, until all the available nitrogen has been exhausted.

The nitrogen in the farm refuse itself is sufficient to meet the needs of these organisms until such time as the refuse is incorporated into the soil; thereafter they avail themselves of the more easily assimilable nitrogen in the soil. Where farm manure and straw are normally applied to the soil, the need for nitrogen in these organisms is so great that they exhaust all the available nitrogen in the soil.

The nitrogen thus assimilated by the organisms remains unavailable to plants until such time as the former die off. This happens when the supply of readily combustible carbon compounds, such as carbohydrates, becomes exhausted.

The period during which the nitrogen is unavailable to plants is called the starvation period, and proves dangerous when it occurs at the commencement of the growing period of plants.

Under optimal moisture and aeration conditions, this starvation period may last from a fortnight to more than a month, depending upon *the carbon-nitrogen ratio.*

The smaller this ratio in the farm refuse, and the larger the supply of readily assimilable nitrogen in proportion to plant material, the shorter the starvation period. The larger the supply of carbon in proportion to nitrogen, the longer the starvation period. Experiments have shown that these organisms require 1 part of nitrogen to every 10 parts of carbon assimilated by them. The carbon-nitrogen ratio in the more commonly known farm products are approximately represented by the following figures:—

	Vetches.	*Clover Hay.*	*Cowpeas.*	*Farm Manure.*	*Cereal Straw.*
Carbon........................	10	20	20	15	40–90
Nitrogen........................	1	1	1	1	1

When vetches are introduced into the soil a starvation period will nevertheless result, since the available nitrogen in the soil is more easily assimilated by the organisms than the nitrogen in the vetches. The soil will regain its available nitrogen only after the

simplification of the nitrogen in the vetches. Nevertheless, the starvation period caused by vetches is much shorter and less dangerous than that caused by cereal straw and clover hay.

Well rotted farm refuse will cause a much shorter starvation period than undecomposed material, since the carbon-nitrogen ratio in the latter is much wider, as a result of which a larger amount of nitrogen is required for its decomposition.

By allowing cereal straw, chaff, leaves, etc., to rot before introducing them into the soil, the disparity in those proportions is lessened and the starvation period shortened.

In the light of the foregoing it is recommended that all farm refuse such as straw, chaff, leaves, etc., which has not been used as bedding in stables and kraals, nor ploughed in during the fallow period, should first be allowed to rot before being incorporated in the soil. In order to reduce to a minimum the loss of plant nutrients during the process of decomposition the refuse may be used for making compost.

In view of this starvation period, it is recommended that decomposed manure and compost be introduced into the soil at least 14 days before sowing or planting is commenced.

External Parasites in Sheep.—

[*Continued from page* 194.

is the same as that for scab. A minimum of three dippings is generally advisable and great care must be taken to ensure that all hard crusts are well softened before dipping.

Mange is included under the Stock Diseases Act as a notifiable disease and all outbreaks should be reported as in the case for scab.

N.B.—*In the next issue lice and ticks will be discussed.*

Anthracnose of Vines and its Control in South Africa.—

[*Continued from page* 210.

supplementary experiment revealed the fact that pure sulphur, if applied properly, is as effective as the copper-sulphur mixtures.

In addition, attention is drawn to (*a*) the importance of thorough applications; (*b*) the desirability of timing applications according to the rainfall; (*c*) the relative unimportance of removing bark; and to other matters of practical importance for the control of this disease.

The Farm Home.

(A Section devoted mainly to the interests of Farm Women.)

Stains on Clothes.

Miss T. Hoek, Senior Home-Economics Officer, Division of Animal and Crop Production.

THE removal of stains is an essential part of the general care of clothes and household linen. Most stains can be removed at home, if reliable methods are employed and a few precautionary measures adopted. Moreover, it is important that the stains be treated immediately. Changes can be brought about in the stain as a result of drying, washing, ironing, and exposure to the air, and for this reason it is usually necessary to use strong chemicals to remove old stains. Often a stain is so fast, or the substance causing the stain is liable to weaken the material to such an extent, that it is impossible to remove the stain without damaging the material.

Nature of Stain and Material.

It is desirable that the nature of the stain should be known, before attempts are made to remove it, because the form of treatment and the appropriate removing agent are determined accordingly. If a wrong agent is used, it is possible that the stain may become faster, and its removal more difficult or even impossible, e.g., if boiling water, which removes most stains of fresh fruit, is used on stains such as those caused by milk, eggs, blood or meat juice, it will be more difficult to remove them later.

It should be known too, what kind of material has been stained, in order that the form of treatment, which will least damage the material, may be chosen. When stains are to be removed from cloth consisting of different kinds of material, e.g., a mixture of silk and cotton, it is necessary to ascertain the effect of the agent on all the materials and to choose that agent which will cause the least damage to the most delicate material.

Effect of Chemicals.

Strong acids destroy cotton and linen, and even weak acids damage them to a certain extent. For this reason strong acids should never be used on such materials, and even if a weak acid is used, it should always subsequently be neutralized with a weak alkali, such as ammonia solution, and rinsed out thoroughly. In general, alkalis are not so harmful to cotton and linen as are acids, although constant or repeated exposure to alkalis, especially in warm solutions, may undermine the material.

Both wool and silk are soluble in strong alkalis, and even washing soda or strong soap may have a very detrimental effect on these materials. Only weak alkalis, e.g., borax or a dilute solution of ammonia, can be used on silk and wool. Dilute acids do not easily injure wool and silk.

Bleaching agents containing chlorine should never be used on wool and silk, as they will do considerable damage to these materials; neither should very hot water be applied to silk or wool, since it turns both these materials yellow, in addition to causing shrinkage in wool and damaging the finish of silk. Unduly hard rubbing will cause felting and shrinkage of wool, while silk will be inclined to tear. Great care should be exercised in removing stains from wool or silk.

Various processes are employed in the manufacture of artificial silk, and accordingly different methods and agents may be indicated for the removal of stains from these materials. All such materials should be handled very carefully when wet, since water usually has a weakening effect on them. Boiling water usually reduces the lustre of such materials. Dilute acids may generally be used in this case, but alkalis usually destroy artificial silks, and bleaching agents should be used with great care on these materials.

Bleaching agents and other chemicals, which are sufficiently strong to remove stains, usually have the effect of bleaching colours. Coloured articles should, therefore, be handled with greater care than plain white materials.

Various Stain-removing Agents.

There are three kinds of stain-removing agents, viz.:—

1. *Absorptive agents.*—Salt, chalk, starch or maize meal are generally used for absorbing stains. These agents, which should be applied as soon as the stain is made, are used mainly for fat stains on unwashable materials; they can then be brushed off with ease.

   Candle wax or fat is often absorbed by blotting paper, if the latter is placed on the stain and pressed with a hot iron.

2. *Solvents.*—Water is the simplest solvent and should, where possible, be tried before resorting to chemicals. Materials which would be damaged by water are usually treated with petrol, turpentine, alcohol, eucalyptus oil, etc. This type of remover, however, is not efficacious in the case of all stains.

3. *Bleaching agents.*—These should, as a rule, be used with the greatest care. They are divided into two classes, viz., acids and alkalis.

The following bleaching agents are very commonly used:—

(i) *Acids.*—Lemon juice, oxalic acid, cream of tartar, tartaric acid and salts of lemon (potassium hydro-oxalate).

(ii) *Alkalis.*—Javel water, ammonia, borax and washing soda.

On no account should Javel water be used on silk or wool. Ammonia and borax are weak alkalis and will not damage the fibres of such materials. Washing soda is too strong for fine materials and bleaches coloured materials, but may be used as a weak solution on linen and cotton.

If a stain has to be removed by means of a bleaching agent, the material is drawn over the top of a jug two-thirds full of hot water; the stain is moistened and the bleaching agent applied to it in drops from a glass tube. Allow the bleacher to remain on the cloth for a few moments, then rinse out, and repeat the process if the stain has not yet been erased. It is by far the best to prepare a dilute solution of the bleaching agent, and, if necessary, to repeat the process a few times, for in a concentrated form the bleaching agent will be liable to damage the material. Care should be taken never to allow the bleaching agent to dry on the material. Wash the material thoroughly with soap and water. If an alkaline agent was used, a very small quantity of lemon juice may be added to the water in which the material is rinsed, and in the case of an acid agent, a few drops of ammonia may be added.

Recipes for Bleaching Agents.

Javel water.—Prepare a solution of 1 lb. washing soda in 4 cups of boiling water, and another of ½ lb. calcium chloride in 8 cups of water. Mix the two solutions, allow to settle, strain the clear fluid and bottle it. The sediment is a good drain disinfectant and may be used for cleaning wash-basins, etc.

For removing stains, one part of this solution is used together with one part of water. It should be used only on white cotton and linen.

Ammonia.—Use approximately one tablespoon to one gallon of water.

Borax.—Dry borax is placed on the stain and then moistened with water.

Oxalic acid.—Use one teaspoon of crystals to one cup of water.

Tartaric acid.—Use ½ teaspoon to 1 cup of water.

Cream of tartar.—Use 1½ teaspoons to 1 cup of water.

Potassium hydro-oxalate.—Use ½ teaspoon to 2 cups of water.

Lemon juice.—This may be used alone, but sometimes salt is applied to a stain and then moistened with lemon juice.

Permanganate of posash.—Prepare a solution of ½ teaspoon of cystals (Condy's crystals) and 1 cup of water. Moisten the stain with water, apply a few drops of the solution and leave it for a few seconds; rinse out and apply a few drops of oxalic acid to remove the stain caused by the permanganate of potash, and then rinse thoroughly.

This agent can be used with success on white linen and cotton. If it has to be applied to coloured material, it is desirable first to try it out on a separate piece of that material, as it affects most colours. Neither is it too successful when used on silk, wool or artificial silk.

The Stain Table.

Stain.	Material and Stain Removers. (Indicated by numbers).*	
	Cotton and Linen.	Wool and Silk.
Blood	2, 2 and 7, 6, 16	2, 2 and 7, 16.
Blue	1, 3, 17 and 2, 18	1, 17 and 2, 18.
Butter, fat and oil	17 and 2, 6, 12, 13, 10	17 and 2, 11, 12, 13, 10.
Chocolate and cocoa	17 and 2, 19	17 and 2, 19.
Coffee	17 and 2, 3, 6	17 and 2, 11.
Cream	1, 17 and 2	1, 17 and 2.
Colouring matter	1, 6	1, 11.
Fruit	3, 14 and 9, 15, 19, 6, 20	2, 14 and 9, 15, 19, 11, 20.
Grass	1, 4, 6	1, 4.
Ink	14 and 9, 20, 15, 18, 11	14 and 9, 20, 15, 18, 11.
Iodine	17 and 2, 7, 4, 8	17 and 2, 7, 4, 8.
Paraffin	17 and 2	17 and 2.
Lampblack	22, 17 and 2	22, 17 and 2.
Machine-oil	17 and 2, 23	17 and 2, 23.
Medicine	1, 4, 21, 14, 18	1, 4, 21, 14, 18.
Paint	17 and 2, 24, 23	17 and 2, 24, 23.
Sweat	17 and 2, 7, 6	17 and 2, 7, 11.
Varnish	4, 23, 12	4, 23, 12.
Rust	15, 11, 6	14, 14 and 9, 18.

* Stain-removing Agents indicated by above-mentioned Numbers.

1. Cold water.
2. Lukewarm water.
3. Boiling water (poured from a height).
4. Alcohol.
5. Tartaric acid.
6. Javel water.
7. Ammonia.
8. Powdered chalk or starch.
9. Salt.
10. Detergent.
11. Permanganate of potash and oxalic acid.
12. Benzine.
13. Petrol.
14. Lemon juice.
15. Oxalic acid.
16. A paste of starch and water.
17. Soap.
18. Hydrochloric acid.
19. Borax and cold water.
20. Potassium hydro-oxalate (salts of lemon).
21. Cream of tartar.
22. Paraffin.
23. Turpentine.
24. Rub the stain with fat or butter and afterwards with petrol.

From the stain table it is possible to determine which agent should be used, if the material and stain are known. Where several agents are specified, the one mentioned first which is usually the simplest, should be tried, e.g., for grass stain on cotton or linen, numbers 1, 4, and 6 are given; this signifies that No. 1 (cold water) should first be tried, and if no result is obtained, No. 4 (alcohol) should be used, and if this is not successful, No. 6 (Javel water) should then be applied.

Recipe for a Detergent.—1 oz. ether, 1 oz. alcohol, 4 oz. ammonia and 1½ oz. white soap of a good quality. Cut the soap into small pieces and heat in 2 cups of soft water until the soap is dissolved, but do not boil the solution. Add 12 cups of cold water, together with the other ingredients, and then pour into bottles provided with tight-fitting corks. Sponge the stain with the solution, diluted with an equal quantity of warm water. The solution is not so strong that it will damage the material, unless kept on it too long. This detergent can be used successfully on the collars of men's jackets and coats.

Crops and Markets

A Statistical and Economic Review of South African Agriculture

by

The Division of Economics and Markets

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CONTENTS

Price Review for January, 1942.*

SLAUGHTER-STOCK.—The normal seasonal decline in cattle prices, though later than usual, set in during January. However, prices during the month were higher than is normal for this time of the year, on account of the restricted supply of marketable cattle resulting from the exceptionally dry weather, which prevailed over large areas of the country up to the end of December. On the Johannesburg market prices of ordinary primes per 100 lb. estimated dressed weight on the hoof declined from 68s. 7d. in December to 54s. 1d. On the Durban Market medium cattle declined from 49s. 2d. per 100 lb. dressed weight on the hook to 45s. 1d., and compounds from 33s. 6d. to 29s. 3d.

On the other hand, the average prices for *slaughter-sheep* increased somewhat as a result of a slight decline in supplies from the major sheep areas. On the Johannesburg market prices of prime merino hamels increased from 8s. 2d. per lb. estimated dressed weight in December to 8s. 7d. in January, and on the Cape Town market prices of prime merinos increased from 6·8d. to 7·4d. per lb.

Prices of *pigs* also improved somewhat on the Johannesburg market during the past month.

Mealies and Kaffircorn.—An increase in the demand for yellow mealies resulted in an increase in prices, viz., from 10s. 1d. per bag f.o.r. in December to 10s. 10d. in January, yellow mealies now

* All prices mentioned are average prices.

being practically on the same price level as white mealies. Prices of white mealies remained unchanged, and a few sales occurred at the maximum prices for small quantities. The prices of kaffircorn continue to increase. During the past month prices of K1 and K2 in bags increased from 20s. 2d. and 20s. 11d., respectively in December to 21s. 5d. and 22s. 3d. per bag.

Hay.—Large supplies of poorer quality lucerne hay on the Johannesburg market caused prices of Cape lucerne to decline from 5s. 3d. per 100 lb. in December to 4s. 10d. in January, and of Transvaal lucerne from 4s. 10d. to 4s. 7d. Teff hay was scarce and prices changed very little. There was also a scarcity of oat hay.

Potatoes.—Larger arrivals of rather poor quality potatoes caused prices on the Johannesburg market to decline, viz., Transvaal No. 1 from 21s. 5d. to 18s. 8d., and N.M. Grade 1 No. 2 from 22s. 2d. in December to 20s. 6d. in January. Cape potatoes predominated on the other markets and prevented supplies from becoming scarce as a result of the absence of Transvaal potatoes.

Onions.—Cape onions were present in large quantities on all markets and everywhere prices declined somewhat. Prices of Cape onions on the Johannesburg market declined from 12s. 4d. per bag in December to 10s. 2d. in January, and on the Cape Town market from 8s. 1d. to 7s. 10d.

In general according to the reports received from the price reporters of the Division of Economics and Markets at the eight principal markets of the Union, it appears that the increased demand caused by the war, and the smaller supplies caused by the drought, resulted in the maintenance of a high level of prices for vegetables, fruits and eggs throughout January. Even where supplies exceeded those for the corresponding months of last year they seem inadequate to meet the demand.

Vegetables.—In-season vegetables were plentiful on the Cape Town, Port Elizabeth and East London markets. On the other markets, however, vegetables were scarce and very expensive. In Durban the presence of a convoy during the early part of the month further strengthened the demand there. Towards the end of the month considerably larger quantities arrived on the Durban market and prices receded sharply. All the markets, with the exception of those of Bloemfontein and East London, were generally well supplied with tomatoes. The quality, however, was generally poor and prices consequently declined on some markets, e.g., in Johannesburg, where the price receded from 1s. 8d. per tray in December to 1s. in January, and in Cape Town where it decreased from 3s. 7d. to 1s. 6d.

Decidous fruits.—Supplies were moderate, and receipts from the western Cape Province in particular, were very light for this time of the year. Excellent prices were obtained everywhere.

Citrus fruits, being out of season, supplies were limited and there was a strong demand as a result of the hot weather. On the Johannesburg market Valencias fetched 3s. 8d. per pocket and on the Cape Town and Durban markets 4s. 7d. and 3s. 11d. per pocket respectively.

Tropical fruit.—These consisted mainly of mangoes. Fewer pineapples appeared on the markets than last year, since large supplies had been bought up for the canning factories.

Eggs.—The moderate supplies of eggs were insufficient to satisfy the demand and prices increased everywhere, e.g., on the Johannesburg market the price of new-laid eggs increased from 1s. 5d. per dozen in December to 1s. 7d. in January, and on the Durban market from 1s. 9d. to 2s. per dozen.

Index of Prices of Agriculture and Pastoral Products.—According to this index, which appears elsewhere, most groups showed very little change during January as against December last. The index for summer cereals increased by 4 points to 131 in January, largely as a result of increases in the prices of yellow mealies and kaffircorn. The index for hay declined from 135 to 126 as a result of a decline in the prices of lucerne. The index for other field crops, i.e., potatoes, sweet potatoes, onions and dry beans, declined from 199 to 180 as a result of a decline in the prices of all these products. For the first time since March 1941, the index for slaughter-stock showed a decline, viz. from 147 to 144. The seasonal decline in the prices of cattle is responsible for this. The group, poultry and poultry products, is the only one that shows a substantial increase for the the month, viz. from 128 to 141. This was due mainly to the rise in the price of eggs.

The combined index shows no change, remaining at 124. *N.B.*—The index for summer cereals has now been revised. It is now known that the total subsidiary payments to producers for 1940-41 averaged 1s. 6d. per bag instead of the previous estimate of 1s. per bag. Those payments for 1941-42 are now estimated to be 1s. 4d. per bag.

Index of Prices for Farm Requisites.—According to the indices of prices paid for various farming requirements, which are shown on page 222, most items have remained unchanged since October, 1941.

The index for agricultural implements and machinery was 120 in January as against 121 in October 1941. This slight decline is probably due to the smaller profit which merchants are compelled to take under the new price control measures (published in October last) whereby the profit margin has been reduced to the pre-war level with due allowance for the increased costs of distribution. This conclusion is made because it is known that the overseas prices of agricultural machinery have increased, and costs of importation have also increased, rather than decreased.

Prices of fertilizers, as previously announced, have been frozen at their September 1941 sales values, and up too the end of January no increases have as yet been allowed. The index for fuel has also remained unchanged, as well as that for dipping and spraying materials and feeding stuffs, whereas the indices for fencing and building materials have changed relatively little.

With respect to feeding stuffs the prices of mealies, mealiemeal, mealie germ and oil-cake meal have increased somewhat, but prices of hay declined, so that the total index remained unchanged.

Prices of bags declined slightly, viz. from 192 in October to 188 in January. Average prices of $2\frac{1}{2}$ lb. A twill grainbags were 11·9d. f.o.r. Durban in October, 11·6d. in December, and in January, 11·5d. Woolpacks ($11\frac{1}{4}$ lb.) were 4s. $5\frac{1}{2}$d. in October and 4s. 4d. in January.

Final Estimate of Expected Wheat Crop: 1941-1942 Season.

ACCORDING to conditions which prevailed towards the end of January, based on reports received from crop correspondents, the Division of Economics and Markets estimates that a wheat crop of 4,120,000 bags (of 200 lb.) may be expected this season as compared with the December estimate of 4,270,000 bags.

The January estimate in bags for the various areas is as follows (the corresponding figures as estimated in December being shown in brackets):—Cape Province 2,870,000 (2,920,000); Orange Free State, 700,000 (800,000); Transvaal 550,000 (550,000); Union 4,120,000 (4,270,000).

Prices of Dairy Products.

AS was announced in the *Government Gazette* of 30 January 1942, prices for butterfat and cheese milk have been increased by 1d. per pound and per gallon, respectively, with effect from 1 February 1942. Prices of 1st, 2nd and 3rd grade butterfat are now 1s. 5d., 1s. 3d. and 1s. 1d. per lb., respectively, and the price of cheese milk $8\frac{1}{2}$d. per gallon.

In order to make these higher prices possible the wholesale and retail prices of butter and cheese have also been increased by 1d. per lb. and are now as follows:—

		1st Grade.	*2nd Grade.*	*3rd Grade.*
		s. d.	s. d.	s. d.
Butter:	Wholesale price	1 8	1 6	1 4
	Retail price ...	1 10	1 8	1 6
Cheese:	Wholesale price	1 3	1 2	1 0
	Retail price ...	1 6	1 5	1 3

Apart from these price increases the Dairy Board also decided to make a supplementary payment (from its levy funds) of $\frac{1}{2}$d. per gallon on all milk delivered to cheese factories during December 1941 and January 1942. This payment is intended as a compensation for the increased costs of production caused by the drought.

Furthermore, the Board intends paying, as from 1 May 1942, out of the levy funds contributed by the manufacturers of cheese and butter a subsidy of $1\frac{1}{2}$d. per gallon on cheese milk delivered to cheese factories and of 3d. per lb. on all grades of butterfat delivered to creameries, with a possible further increase for butterfat from July.

The average summer price for cheese milk for the previous season was 6d. per gallon, while for the present summer it has been 8d. per gallon up to January and is $8\frac{1}{2}$d. at present. The highest price paid during the 1940-41 season was 8d. per gallon, viz., in

June 1941. It is provisionally estimated that the average price for cheese milk as calculated from the above prices and subsidies will be approximately 8·4d. per gallon for the 1941-42 season as against an average price of 6·3d. for the 1940-41 season.

With respect to butterfat the summer price during November and December 1940 was 15d. per lb., and thereafter 14d. per lb., while the prices paid this summer were 16d. per lb. during December and January, and are 17d. at present. Thus, the average price for the 1941-42 season will be approximately 17·1d. per lb. as against an average of 14·3d. for the 1940-41 season.

With these measures for the present season the Board hopes that producers will do everything in their power to maintain production. According to the most recent data the production of creamery butter and factory cheese is still considerably below that of the previous season. The production of creamery butter in the Union during December 1941 amounted to 3,142,281 lb. as against 4,602,954 lb. during December 1940. For January 1942 the production is estimated at 4,027,000 lb. as against 5,853,904 lb. during January 1941. The production of factory cheese in the Union was 1,261,685 lb. during December 1941 as against 1,348,258 lb. during December 1940, and approximately 1,193,000 lb. during January 1942 as against 1,571,911 lb. during January 1941.

Sale of Dried Fruits, 1942.

ACCORDING to regulations published in the *Government Gazette Extraordinary* of 29 January 1942, raisins, sultanas and currants may be sold only through the Dried Fruit Board. Furthermore, the export of any dried fruits or nuts is prohibited, except under permit.

Last year the Government had also given the Dried Fruit Board control over the marketing of dried vine products under emergency regulations. Approximately 70 per cent. of the production of dried vine products have to be exported. Therefore the agreement with the British Ministry of Food for the purchase of the surplus last year has been renewed for this year. They have succeeded in obtaining an increase in the overseas prices, so that the Board, according to estimates, will be in a position to pay producers an average price of 2·37d. per pound for raisins, and slightly more for sultanas. This price is based on the expected proceeds to producers obtainable from both the foreign as well as the domestic markets. The corresponding price fixed for the previous season was 2·25d. per lb.

However, since the K.W.V. has increased the price of distilling wine from £3. 11s. 11d. to £4. 2s. 3¾d. for the present season, producers are now demanding a price for raisins and sultanas which would correspond to the increased price for distilling wine, plus 20s. per ton of fresh grapes to cover the extra costs and risks entailed in the drying. On the recommendation of the Board it has now been agreed that the K.W.V. and the Government jointly will give the Board the necessary guarantees to enable the latter to pay producers an average price of 2·65d. per lb. for raisins and sultanas.

The following are the net cash prices (free on rail and free of any levies) which the Board will pay to producers:—

Orange River type of unbleached sultanas, western Cape Province type of unbleached sultanas and black and white currants: 5d., 4d., 3d., 2d., 1d.
Loose raisins: 4d., $3\frac{1}{4}$d., $2\frac{1}{8}$d., $\frac{3}{8}$d.
O.R. type sultanas: $3\frac{5}{8}$d., $3\frac{1}{8}$d., $2\frac{5}{8}$d., $2\frac{1}{8}$d., $\frac{5}{8}$d.
W.P. type sultanas: 3d., $2\frac{1}{2}$d., $2\frac{1}{8}$d., $\frac{1}{2}$d.
Black currants: 4d., $3\frac{5}{8}$d., $2\frac{1}{2}$d.
White currants: $2\frac{1}{2}$d.

According to Proclamation No. 15 in the *Government Gazette* of 2 January 1942, the levy on dried fruits (which is payable to the Board by merchants buying from producers) has also been increased from 4d. to 5d. per 100 lb. net weight, with effect from the beginning of January.

Index of Prices Paid for Farming Requisites.

Year and Month.	Implements. (*a*)	Fertilizers. (*b*)	Fuel. (*c*)	Bags. (*d*)	Feeding Stuffs. (*e*)	Fencing Material (*f*)	Dipping and Spraying Material. (*g*)	Building Material. (*h*)
Base—								
1936-38...	100	100	100	100	100	100	100	100
1936......	98	94	106	99	98	84	100	95
1937......	100	100	98	103	97	102	100	103
1938......	103	106	96	99	105	114	100	102
1939......	105	106	98	146	90	114	100	103
1940......	120	139	117	171	95	176	112	124
1940—								
January...	113	127	112	233	89	149	112	115
April......	122	131	112	181	93	166	112	122
July.......	122	139	113	155	96	182	112	127
October....	123	149	125	147	99	191	113	127
1941—								
January...	124	166	125	152	99	192	113	128
April......	124	166	125	174	109	198	114	136
July.......	124	173	125	182	114	210	119	151
October....	121	173	125	192	114	231	119	162
1942—								
January (*j*)	120	173	125	188	114	230	119	165

The following is the composition of the above groups. (The items are weighted according to their respective importance):—

(*a*) Ploughs, planters, seed drills, harrows, cultivators, ridgers, mowers, binders, hay rakes, silage cutters, hammer mills, separators, windmills, shares, land-sides, mouldboards, knife, pitman, guard.
(*b*) Superphosphate, ammonium sulphate, potash, muriate, bonemeal.
(*c*) Petrol, power paraffin, crude oil, grease, lubricating oil.
(*d*) Woolpacks, grain bags, sail twine, binder twine.
(*e*) Mealies, bran, oats, lucerne, groundnut-oil cake, bonemeal, salt.
(*f*) Fencing wire, standards, baling wire.
(*g*) Bordeau mixture, lime sulphur, arsenate of lead, cyanogas, Cooper's sheep dip, Little's dip, Tixol cattle dip.
(*h*) Corrugated iron, deals, cement, lime, flooring boards.
(*j*) Prelimary.

Mixed Maize Products.

REGULATIONS prohibiting the manufacture and sale of white mealiemeal, mealie rice and samp were published in the *Government Gazette Extraordinary* of the 29 January 1942. White mealies may be used only in mixed products containing not less than 40 per cent. and not more than 80 per cent. yellow mealies. There is no prohibition, however, on the production and sale of mealie products manufactured from yellow mealies alone. Also, only yellow mealies may be turned into crushed mealies, and then only into unsifted crushed mealies.

These measures have become necessary because of the relative shortage of white mealies, and because of the fact that, owing to the drought, proportionately less white maize has been planted during the present season.

The maximum prices for mealie products, as published in the *Government Gazette Extraordinary* of 21 November 1941 will now apply to mixed and to yellow mealie products.

Index of Prices of Field Crops and Animal Products.

(Basic period 1936-37 to 1938-39=100.)

SEASON (1st July to 30th June).	Summer Cereals, (*a*)	Winter Cereals. (*b*)	Hay. (*c*)	Other Field Crops. (*d*)	Pastoral Products. (*e*)	Dairy Products. (*f*)	Slaughter Stock. (*g*)	Poultry and Poultry Products. (*h*)	Combined Index.
WEIGHTS.	19	13	2	3	34	6	17	6	100
1936–37	118	86	93	92	120	86	89	98	105
1937–38	89	106	111	117	97	113	106	108	101
1938–39	92	107	95	88	79	103	106	94	93
1939–40	86	106	76	92	114	105	106	87	103
1940–41	109	113	105	159	101	108	110	110	108
1940—									
January	97	108	66	87	120	103	103	82	106
February	94	109	74	75	128	103	104	83	108
March	99	109	73	85	132	103	105	92	111
April	99	109	81	100	139	103	100	115	115
May	109	108	86	104	133	106	103	123	116
June	103	109	92	112	114	110	99	104	107
July	101	109	97	132	102	116	101	100	104
August	102	109	109	149	102	116	103	80	104
September	106	109	113	216	102	116	109	80	108
October	107	108	99	225	99	114	117	83	108
November	111	115	112	168	100	107	117	88	109
December	121	115	109	147	101	107	116	100	111
1941—									
January	121	115	98	121	100	104	115	96	109
February	122	115	92	115	100	104	112	107	109
March	135	115	87	125	100	104	105	125	112
April	126	116	98	167	101	106	108	151	114
May	112	116	125	160	101	109	108	157	112
June	110	116	126	183	101	111	111	150	113
July	112	118	128	241	100	130	118	145	117
August	111	118	132	216	100	130	119	109	114
September	118	118	154	228	100	130	128	108	118
October	124	119	138	268	100	128	135	115	121
November	124	133	110	250	100	128	140	118	123
December	127	132	135	199	100	122	147	128	124
1942—									
January	131	132	126	180	100	122	144	141	124

(*a*) Maize and kaffercorn.
(*b*) Wheat, oats and rye.
(*c*) Lucerne and teff hay.
(*d*) Potatoes, sweet potatoes, onions and dried beans.
(*e*) Wool, mohair, hides and skins
(*f*) Butterfat, cheese milk and condensing milk.
(*g*) Cattle, sheep and pigs.
(*h*) Fowls, turkeys and eggs.

Average Prices of Slaughter Cattle and Pigs.

Season (1st June to 31st May).	Beef per 100 lb.						Pigs per lb. Live Weight.		
	(a) Johannesburg.				(b) Durban.		Johannesburg.		
	N.M. Prime.	Ordinary. Prime.	Good Medium.	Com-pounds.	Medium.	Com-pound.	Porkers, Prime.	Baconers, Prime.	Stores.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	d.	d.	d.
1938–39	41 9	39 0	36 3	31 7	33 0	27 4	5·3	6·2	4·9
1940–41	43 11	41 4	37 11	32 5	31 1	25 4	4·5	5·4	4·0
1940—									
November	48 1	45 4	42 0	36 6	34 5	27 6	4·7	5·7	4·3
December	46 8	44 7	40 2	35 3	31 7	25 9	4·5	5·6	3·9
1941—									
January	45 7	42 11	39 6	34 7	32 2	27 7	4·8	5·7	4·0
February	45 0	41 2	38 1	32 9	29 11	24 5	4·3	6·2	4·1
March	40 6	38 3	35 5	29 7	27 11	21 4	4·2	6·1	3·6
April	42 4	39 10	36 3	30 1	29 10	25 5	4·2	5·6	3·8
May	44 6	40 8	36 10	30 9	29 4	22 1	4·2	5·6	3·9
June	43 9	41 2	37 6	32 8	32 2	25 9	4·3	5·4	3·7
July	46 5	44 5	39 10	33 5	34 6	29 11	4·6	5·6	4·0
August	47 0	44 9	41 2	33 7	35 5	29 3	4·5	5·6	3·5
September	49 11	47 1	44 2	36 11	41 9	33 11	4·8	5·6	3·7
October	56 5	53 6	50 1	44 11	46 1	34 8	5·0	5·6	4·2
November	68 4	63 2	55 5	42 8	51 4	36 4	5·5	6·2	4·8
December	72 2	68 7	60 3	43 0	49 2	33 6	5·4	6·4	4·9
1942—									
January	63 2	59 6	54 1	43 5	45 1	29 3	5·6	7·0	5·6

(a) Estimated dressed weight of cattle as sold on the hoof. As reported by Meat Control Board.
(b) Dressed weight of carcase sold on the hook.

Average Prices of Sheep per lb. Estimated Dressed Weight.*

Season (1st June to 31st May).	Johannesburg.				Cape Town.			
	Merino Wethers.		Persians and Cross Breds.		Merinos.		Capes and Persians.	
	Prime.	Medium.	Prime.	Medium.	Prime.	Medium.	Prime.	Medium.
	d.	d.	d.	d.	d.	d.	d.	d.
1938–39	6·3	5·5	5·8	5·1	5·8	5·6	5·9	5·7
1940–41	6·7	6·1	6·2	5·7	6·1	5·8	6·3	6·0
1940—								
November	6·9	6·2	6·1	5·5	5·8	5·5	6·3	6·1
December	7·0	6·5	6·5	6·1	6·1	5·9	6·4	6·1
1941—								
January	7·0	6·5	6·5	6·0	6·3	6·1	6·4	6·1
February	7·1	6·6	6·7	6·2	6·9	6·5	6·8	6·5
March	6·7	6·1	6·2	5·7	6·3	5·9	6·2	5·9
April	7·0	6·5	6·4	5·9	6·6	6·1	6·4	6·1
May	7·1	6·5	6·6	6·0	6·0	5·8	6·3	6·0
June	7·1	6·6	6·6	6·1	6·3	5·9	6·5	6·2
July	7·7	7·0	7·2	6·6	7·0	6·7	6·9	6·6
August	7·6	7·0	7·1	6·5	7·1	6·7	6·8	6·6
September	8·2	7·6	7·7	7·0	7·2	6·8	7·2	6·9
October	7·4	6·7	7·0	6·3	6·6	6·4	6·8	6·6
November	7·4	6·8	6·9	6·3	6·8	6·5	6·9	6·6
December	8·2	7·4	7·6	6·8	6·8	6·5	6·8	6·5
1942—								
January	8·7	7·8	7·5	6·7	7·4	7·1	7·4	7·2

* As sold on the hoof. Reported by Meat Control Board.

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FARMING IN SOUTH ... AFRICA

Vol. 17 APRIL 1942 No. 193

Editorial:

Agro-Economic Demarcation of Farming Regions in the Union.

ELSEWHERE in this issue appears a brief preliminary report on the *Agro-economic Survey* of the Union's agricultural areas which was instituted by the Division of Economics and Markets in 1936. Since the fieldwork of this research (as far as completed to date) covered a number of years, an attempt was made to base the incomes as far as possible on the prices of 1936 in order to obtain a basis for comparison. As the completion of the work is being considerably hampered by the present conditions, it was considered advisable to give a short summary of the completed portion which includes some of our most important farming areas. Advice and critiscism from farmers and agriculturists will be greatly appreciated by the Division. They are requested, however, to bear in mind that this report had to be very concise and that the principal task was to demarcate general *regions* which differ materially from one another and to define *boundaries*. A complete and detailed analysis of agricultural conditions in each area could not be undertaken at this stage. The Division trusts, however, that this *regional demarcation* which has been arrived at after a careful local investigation, will be of permanent value and that it will form the indispensable basis for more intensive continuation studies. Many professional officers participated in this research and appreciative mention must be made of the assistance and advice received from the Division of Chemical Services and the Division of Botany and Plant Pathology and especially of the extension and other officers of the Division of Animal and Crop Production. The survey was started under the guidance of Prof. W. J. Pretorius and continued under Mr. J. S. P. Naude and Dr. W. H. v. d. Merwe of the Division of Economics and Markets. The following economists assisted with the field work: Drs. J. C. Neethling and F. R. Tomlinson, Messrs. G. J. C. Uys, A. R. Havemann, A. J. du Plessis, and P. E. de Waal.

(Dr. J. F. W. Grosskopf, Chief, Division of Economics and Markets.)

Useful Bushveld Trees and Shrubs.

Their Value to the Stock Farmer.

J. C. Bonsma, Animal Husbandry Research Officer, Division of Animal and Crop Production.

KNOWLEDGE of the bushveld trees and shrubs would prove of real value to the stock farmer since trees and shrubs are usually an indication of the quality and type of grass to be found in a particular area. Furthermore, many bushveld trees and shrubs serve as an important source of feed for animals, especially in times of drought.

TABLE I.—*Composition of Mopani.*

Month.	Percentage on dry basis.			
	Crude protein.	Crude fibre.	P_2O_5.	CaO.
January	13·7	28·1	0·190	1·51
Februarie	13·7	27·6	0·180	1·80
March	12·0	26·8	0·137	2·04
April	12·4	26·7	0·128	1·41
May	11·2	25·6	0·196	2·28
June	11·5	24·8	0·116	1·33
July	—	—	—	—
August	13·8	21·9	0·193	1·35
September	8·4	24·9	0·116	3·23
October	11·6	25·3	0·117	2·98
November	16·6	22·1	0·228	1·15
December	12·0	27·6	0·187	1·37
Average	12·6	25·3	0·172	1·86

Deciduous trees and shrubs are drought-resistant to an exceptional degree, and although many of the trees do not lose their leaves until winter is well advanced, the dry leaves retain their great nutritive value for animals.

As mentioned above, the trees and shrubs may be regarded as an indicator of the quality of the veld. So, for instance, good sweetgrasses such as buffalo-grass (*Panicum maximum*) are usually to be found where Umbrella thorn (haakdoring) (*Acacia spirocarpoides* or *A. litakunensis*) and the Karoo thornbush (*Acacia karoo*) occur. On the other hand, bush willow (rooibos) (*Combretum apiculatum*), wild quince (*Cryptocarya transvaalensis*), the South African beech (*Faurea saligna*), white syringa (*Kirkia acuminata*)

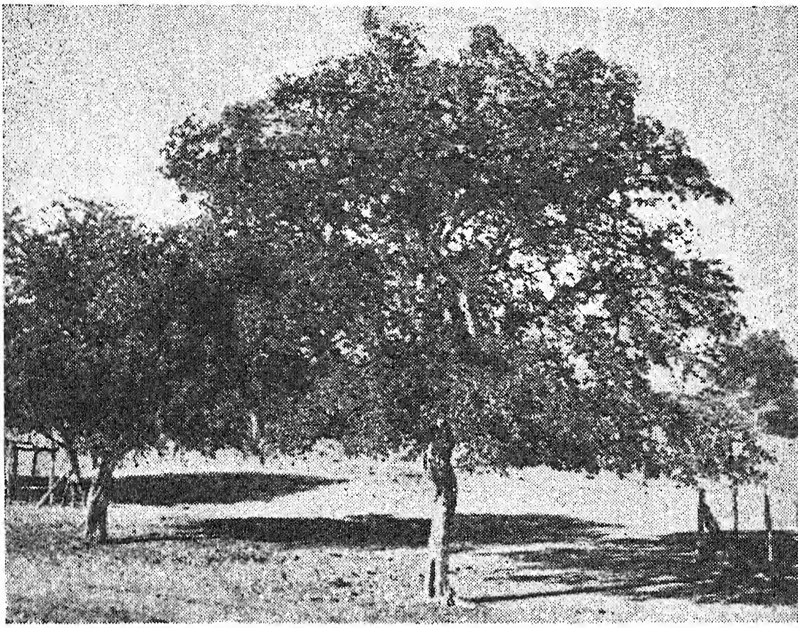


Fig. 1.—Mopani Tree.

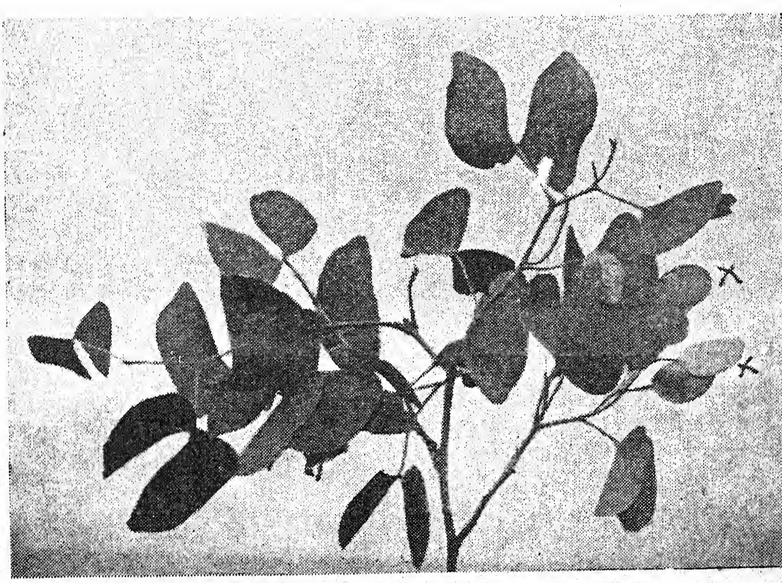


Fig. 1a.—A Mopani branch clearly showing the shape of the leaves. Note the pods marked X on the right hand side of the branch.

and others occur on hard, sandy or rising ground which provides good grazing only in spring and early summer, i.e., these trees are found on sour veld.

On mixed veld one usually finds such trees as the marula (*Sclerocarya caffra*), camel-thorn (*Acacia giraffe*), witgatboom (*Capparis albitrunca*), buffalo thorn (blinkblaar-wag-'n-bietjie) (*Zizyphus mucronata*), sekelbos and leadwood (*Combretum imberbe*) growing amongst haakdoring trees.

In the case of veld on which gifblaar is encountered, large numbers of wild syringa (*Burkea africana*) are generally to be found, as well as wild quince to a lesser extent.

TABLE II.—*Composition of Witgat, Matoppie* (Capparis albitrunca).

Month.	Percentage on dry basis.			
	Crude protein.	Crude fibre.	P_2O_5.	CaO.
January	17·0	32·5	0·122	1·61
February	14·9	37·3	0·085	1·11
March	12·9	35·1	0·102	1·32
April	14·5	34·8	0·076	1·10
May	13·4	31·5	0·066	1·10
June	13·0	34·6	0·068	0·84
August	12·5	24·2	0·097	1·39
September	13·6	30·2	0·120	1·05
October	15·7	36·2	0·058	1·49
November	13·6	32·7	0·070	1·28
December	18·8	23·7	0·125	1·55
Average	14·5	32·0	0·09	1·26

In certain areas of the lowveld, animals are practically entirely dependent upon edible trees and shrubs for their feed.

This article aims at giving a brief description of some of the edible shrubs and trees, as well as indicating their nutritive value.

(1) Mopani *(Copaifera mopane)*.

The entire area of the Transvaal bushveld or lowveld north of the Letaba River, i.e., that portion of the country lying between the Letaba and Limpopo rivers, is covered with Mopani (shrubs and trees).

The Mopani is a deciduous tree occurring in areas with deep soil and grows to a height of up to 60 feet with a diameter of 18 inches. North of the Zoutpansberg and extending far into Rhodesia the Mopani is usually a small tree or shrub, seldom growing higher than 15 feet.

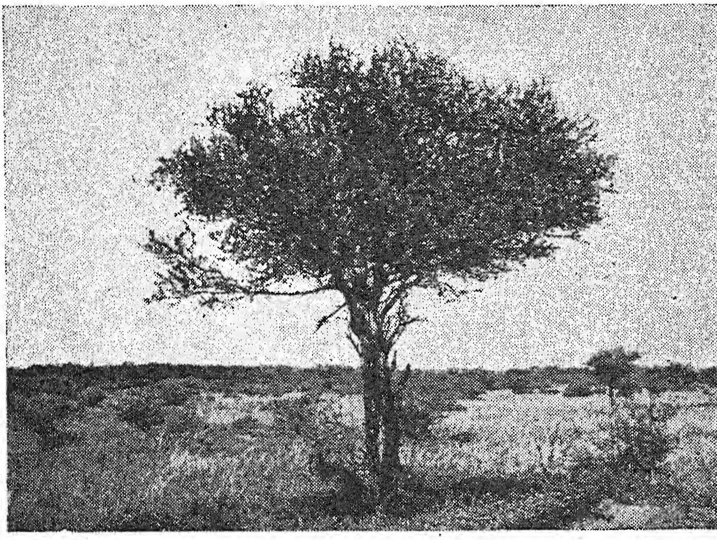


Fig. 2.—Witgatboom. Note to what extent the tree has been denuded of twigs and leaves within the reach of animals.

Fig. 3.—A branch of the Witgatboom showing the shape of the leaves.

The bark of the tree is fibrous and greyish brown in colour. Ants are often encountered under the bark. The leaves are butter-fly-shaped, i.e., they have a short midrib with two wings. During hot, dry weather the leaves are folded together (Fig. I). The seed is a flat half-moon-shaped pod; the seeds inside the pod are kidney-shaped and ribbed, and smell strongly of turpentine when rubbed between the fingers. The wood is attractive in appearance, having a reddish brown colour with dark brown mottling. Unfortunately, it is difficult to obtain good pieces of the wood, which is very heavy and hard and, consequently, difficult to work.

TABLE III.—*Composition of Rooibos.*

Month.	Percentage on a dry basis.			
	Crude protein.	Crude fibre.	P_2O_5.	CaO.
January	14·0	24·7	0·237	1·36
February	12·8	30·1	0·135	1·23
March	11·2	31·9	0·109	1·80
April	10·6	30·4	0·114	1·08
May	10·3	31·3	0·122	1·56
June	7·0	37·3	0·058	2·63
August	5·1	45·1	0·082	2·59
September	8·0	29·0	0·115	2·37
October	15·2	25·6	0·172	1·95
November	14·6	25·0	0·153	1·81
December	12·2	28·9	0·136	1·11
Average	11·0	31·0	0·130	1·77

Observations made on the grazing habits of cattle have shown that in the lowveld north of the Zoutspansberg, cattle feed on the leaves and thin stalks of the Mopani throughout the year.

In early summer when the Mopani leaves are still young, they have a mildly laxative effect on animals. The breath of animals feeding on green Mopani leaves smells strongly of onions.

Repeated tests have been carried out on cattle existing almost entirely on Mopani in order to discover whether this imparts a taint to the milk, but apparently such is not the case, nor has any taint been discovered after cooking, in the meat, hot or cold, of such animals.

It is remarkable that with a plant whose leaves and seed smell so strongly of turpentine and other volatile oils that even the kraal occupied by animals feeding on Mopani veld is characterised by the smell of onions, no taint is imparted to the animal products, viz., the meat and milk.

Those portions of the Mopani trees on which cattle feed were analysed monthly; all the samples showed an exceptionally high

Fig. 4.—Rooibos (*Combretum Zeyheri.*)

Fig. 5.—Rosyntjiebos (*Grewia flava.*)

crude protein content, the average monthly crude protein content being 12·6 per cent.

(2) Witgat, Matoppie (*Capparis albitrunca*).

This tree is widely distributed throughout the country, occurring particularly in the Karoo, the north-western Cape, the Orange Free State, Natal, the northern Transvaal and Bechuanaland. It has a characteristic greyish white trunk with a round dark green crown.

The name "witgat" is derived from the fact that the wood is white and that the trunks often have folds or seams looking like holes which give the impression that the trunk has grown too rapidly for the bark. Sometimes portions of the folds rot as a result of which holes are formed in the stem, in which birds such as the hornbill make their nests.

TABLE IV.—*Composition of Rosyntjiebos.*

Month.	Percentage on a dry basis.			
	Crude protein.	Crude fibre.	P_2O_5.	CaO.
January	15·9	27·1	0·185	1·83
February	15·2	28·7	0·135	1·40
March	10·7	34·2	0·091	1·64
April	9·6	35·1	0·092	1·38
May	9·0	33·8	0·091	1·44
June	8·3	33·8	0·106	1·43
August	9·2	32·9	0·116	2·78
September	10·8	29·8	—	—
October	11·3	35·2	0·153	1·37
November	15·3	26·0	0·217	1·17
December	15·1	21·9	0·194	1·41
Average	11·85	30·7	0·138	1·585

The trees usually grow to a height of from 10 to 20 feet and are mostly found on mixed veld or on open plains, but very seldom on river veld, although many of these trees occur along the dry Malopos River (Fig. II).

The leaves are oblong in shape with rounded ends; the leaf has a pointed base and is attached to the twig by means of a thin stalk (Fig. III).

The flowers are yellow, star-shaped and sweetly-scented. The seed is a round berry having a diameter of approximately ¼ inch and containing 1 seed.

The wood of *Capparis albitrunca* is almost white, and hard and heavy.

Cattle, horses, donkeys, goats and wild buck have a predilection for the young stalks and leaves of this tree, which they denude as far as they can reach.

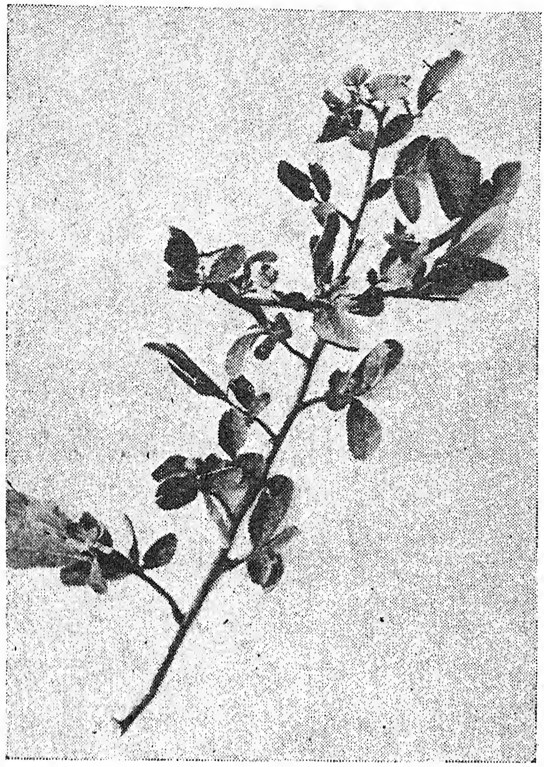


Fig. 6.—A branch of rosyntjiebos showing the shape of the leaves. A few flowers car also be noticed on the branch.

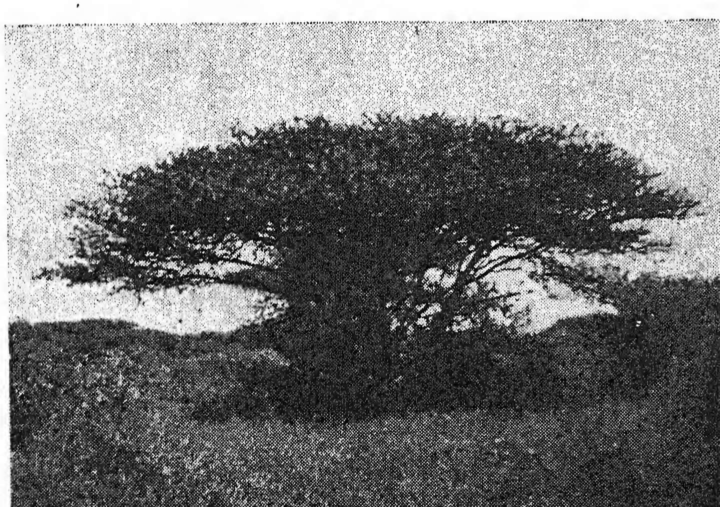


Fig. 7.—A typical specimen of Haakdoring (*Acacia litakunensis*) occurring in good sweet veld.

During times of drought, goats and donkeys feed on the bark of the tree, leaving the trunk bare. Using their horns, kudu bulls bring down young twigs and shoots beyond the reach of their mouths in order to feed on them.

The milk of cows which have fed extensively on these stalks and leaves has an exceptionally unpleasant taint. Indeed, so marked is this that the milk becomes undrinkable and, when served in tea or coffee, can be smelt even before being drunk.

The witgatboom is, however, of great value to the stock farmer since the trees are evergreen and in times of drought may prove most useful in preventing losses.

Animals feed on *Capparis albitrunca* throughout the year. Tests showed that the stalks and leaves eaten by animals have an

TABLE V.—*Composition of Kruisbessie.*

Month.	Percentage on a dry basis.			
	Crude protein.	Crude fibre.	P_2O_5.	CaO.
January	14·5	26·4	0·143	1·61
February	14·6	30·5	0·140	2·26
March	14·0	31·3	0·136	2·21
April	12·4	30·7	0·109	2·32
May	10·6	28·7	0·113	2·17
June	6·7	41·2	0·075	1·25
August	—	—	—	—
September	9·3	30·3	0·109	2·45
October	17·0	30·8	0·198	1·75
November	16·7	32·7	0·151	1·89
December	15·9	27·7	0·189	1·70
Average	13·17	31·03	0·137	1·961

exceptionally high crude protein-content, the average being 14·6 per cent.

(3) Bush Willow (Rooibos) (*Combretum apiculatum*).

Rooibos occurs in most parts of the ranching areas of the northern, north-western and north-eastern Transvaal.

To a large extent, the nature of the tree depends upon the locality and the type of soil in which it grows. In parts of the Pretoria district the tree sometimes reaches a height of 30 feet with a diameter of 18 inches, whereas in parts of the Zoutpansberg area it is merely a shrub with twisted stems (Fig. IV). The leaves are oval in shape with a midrib and delicate veins. During autumn the leaves turn reddish-brown. The flowers grow in small, white, downy racemes. Each four-winged fruit contains only one seed.

The wood is exceptionally heavy and hard, but large, useful pieces are seldom found. Small pieces of processed rooibos wood are almost black, with golden coloured mottling.

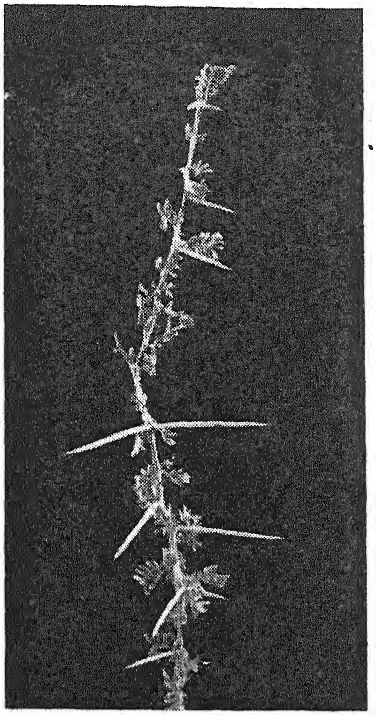


Fig. 8.—A twig of Haakdoring showing the shape of the leaves as well as the hooks and thorns.

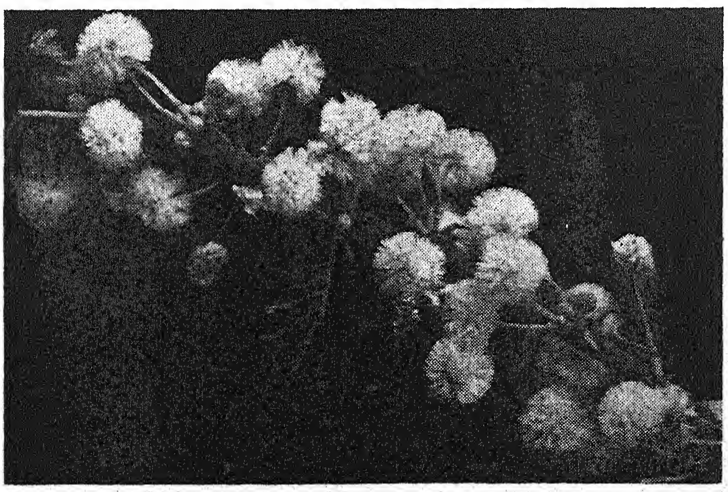


Fig. 9.—The flowers of Haakdoring; round, downy, white-coloured and sweet-scented.

Rooibos and leadwood (*Combretum inberbe*) are the most sought after for fire-wood in the bushveld.

The value of *Combretum apiculatum* to the cattle farmer has not yet been fully determined. In certain parts of the country, e.g., in the Pretoria district, cattle do not feed on it at all or only to a slight extent. In the Zoutpansberg there are certain areas where cattle feed on it only during the late winter months and in very early spring. In these parts, unfortunately, *Combretum apiculatum* occurs practically only on the early summer veld; consequently, animals make very little use of the trees.

North of the Zoutpansberg cattle feed on *Combretum apiculatum* practically throughout the year, although they show a preference for the leaves just before the latter begin to fall off. Cattle also eat large quantities of leaves which have already been shed.

The average crude protein-content of *Combretum apiculatum* is 11 per cent. and therefore lower than that of Mopani and *Capparis albitrunca*. It is remarkable, however, that *Combretum apiculatum* is most readily eaten by cattle when the protein-content of the leaves is at its lowest.

Rosyntjiebos en Kruisbessie *(Grewia flava)* and Cane.

Rosyntjiebos and kruisbessie occur in most of the ranching areas of the country, e.g., the northern Transvaal, Bechuanaland and along the Vet River in the Orange Free State.

The two shrubs are very similar in appearance, the most marked difference between them as far as the cattle farmer can discern being that the rosyntjiebos bears two berries at the end of a fruit stalk, whereas the kruisbessie bears four such berries in the form of a cross at the end of the stalk.

The shrubs usually grow to a height of from 3 to 5 feet (Fig. V). The stems seldom have a diameter of more than 1 inch. Often the young stems are almost square, only the edges being rounded. The leaves are ovate and the edges slightly crenate; one end is rounded, whereas the other end attached to the stalk is pointed. The leaves are dark green on the upper and greyish green and slightly hairy on the lower surface; they grow from 1 to 2 inches in length and ½ to 1 inch in breadth (Fig. VI).

The flowers are yellow and occur throughout the year, but are more profuse in spring.

Cattle do not ingest large quantities of the leaves and thin twigs at a time, although reasonable quantities are grazed by them during the winter months before the leaves drop. In Bechuanaland cattle feed on rosyntjiebos during the early spring months.

The edible part of the shrubs have a comparatively high crude protein-content, viz., 12·5 per cent., and even during the winter months the average crude protein-content is almost 10 per cent.

Umbrella Thorn (Haakdoring) [*Acacia spiracarpoides (Alitakunensis)*].

No description of bushveld trees would be complete without mention of the widely known haak-en-steek thorn-tree (*Acacia spiracarpoides*). Bushveld farmers usually refer to their sweet winter

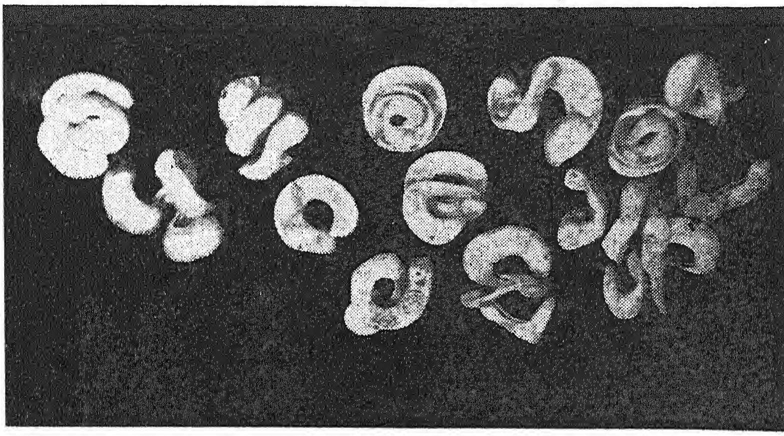


Fig. 10.—The pods of Haakdoring; they are always curled up in the form of a spiral.

Fig. 11.—Karroo-thornbush (*Acacia karroo*); occurs mostly in sweet veld in river areas.

veld as haakdoring veld. The haakdoring tree seldom grows to a height of more than 18 feet (Fig. VII).

The leaf stalk usually bears from 6 to 8 pairs of leaves; these are sub-divided into 15 pairs along the midrib and are slightly hairy. Two kinds of thorns occur on the tree and are arranged alternately along the branches, viz., a strong dark-coloured hook-thorn and a pair of long white thorns approximately an inch farther along the branch (Fig. VIII).

Usually one pair of hook-thorns on a young branch are transformed into long white thorns in the following year. The flowers are round, downy and white in colour (Fig. IX).

The pods are approximately ¼ inch broad and approximately 3 or 4 inches long, and are curled in the form of a spiral (Fig. X).

The pods are very loosely attached to the branches, and when cattle touch the twigs with their tongues, the pods drop into their mouths. It has been observed that during the winter months animals spend long periods under *Acacia spiracarpoides* swallowing these dry pods with their tongues extended.

An exceptionally large quantity of these pods is ingested by animals. The seed is consequently distributed in the dung, with the result that numerous *Acacia spiracarpoides* shrubs are found growing around drinking places.

The pods of *Acacia spiracarpoides* are rich in protein: according to an analysis of pods collected during the period in which they are eaten by animals, the following values were obtained on an air-dry basis, viz., Proteins—18·83 per cent.; fat—2·44 per cent.; carbohydrates—46·25 per cent.; minerals—5·1 per cent.; and crude fibre —20·1 per cent.

Being rich in protein, the pods are eaten in large quantities when the protein-content of grass is at its lowest. This is therefore a case illustrating how nature balances its own rations.

When the protein-content of all the above-mentioned trees and shrubs is taken into account, it is not surprising that animals become so fat during the winter months on adequate bushveld grazing.

This also explains to a large extent why animals which by way of experiment received a supplementary protein feed of 1½ lb. per head per day during the winter months in the bushveld, showed no greater increase in weight than animals receiving no supplementary protein feed.

It is remarkable that when compared with grass all the bushveld shrubs and trees consumed by animals vary so slightly as regards their protein and phosphorus content during the different seasons of the year. Furthermore, it is clear that with proper veld control there is no reason why animals should be in poor condition in the bushveld where nature itself provides a balanced ration for the animals.

It is hoped to publish further articles in the future dealing with the value of trees and shrubs to the cattle farmer.

The hope is also expressed that by indicating the value of these bushveld trees to the cattle farmer these articles will in some measure serve to prevent these trees from being cut down for fire-wood.

The practice of cutting down trees such as the camel-thorn (*Acacia giraffae*) and the wild olive (*Olea verrucosa*) in order to sell

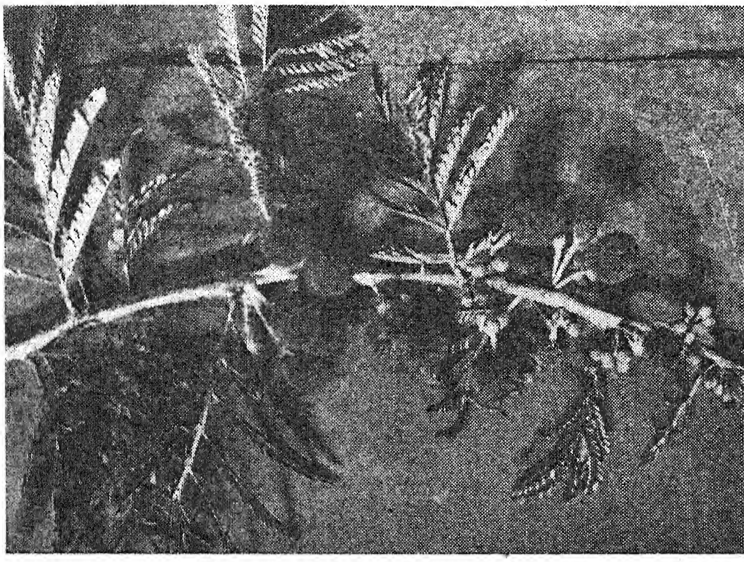


Fig 12.—The flowers of Karroo-thornbush: round, downy, of a dark yellow colour, larger than the flowers of Haakdoring.

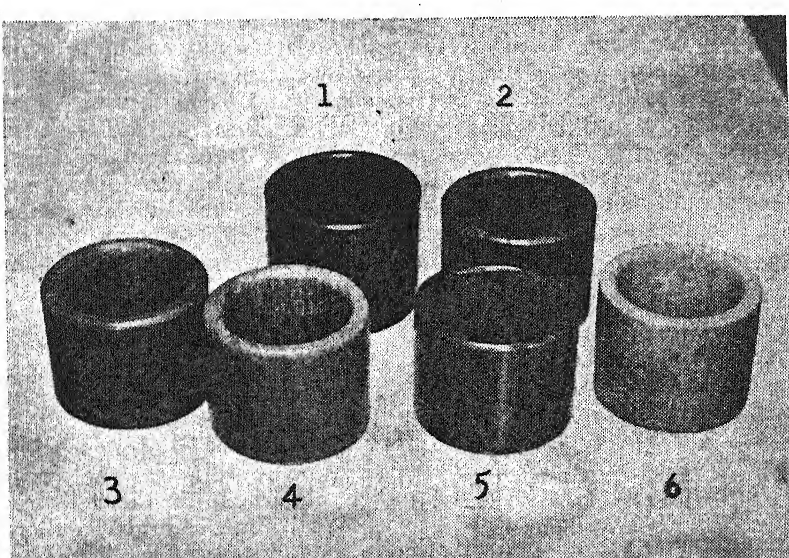


Fig. 13.—Serviette rings made by a cattle farmer from bushveld wood varieties:—

(1) *Combretum Zeyheri*—wood almost black with gold-coloured veins; (2) *Combretum*—wood dark brown, almost black, with attractive veins and occasional white marks; (3) *Copaifera mopane*—reddish brown wood with attractive dark brown veins; (4) Kiaat wood; (5) Knobthorn (*Acacia pallens*)—dark brown wood with attractive veins; and (6) Bushveld mahogany.

 [*Continued on page* 259.

Dryland Wheat for the coming Season in the Summer-rainfall Area.

F. X. Laubscher, Potchefstroom College of Agriculture.

THE present summer season commenced so late that many farmers were unable to make full use of their arable land owing to the great risk of frost damage to late summer crops. Judging from letters received from farmers it would appear that many are considering the advisability of putting such lands under winter crops.

The light in which the Department of Agriculture and Forestry regards cases where farmers are desirous of sowing wheat for the first time is reflected in the recent report of the Wheat Commission, viz., that expansion in the production of wheat even in the present state of emergency may not be unsound agriculturally. Consequently, any recommendation as regards wheat production under dryland conditions in the summer-rainfall area, will be applicable only to the established wheat areas, although emergency planting in the eastern Transvaal highveld certainly holds out possibilities.

Dryland wheat production in the summer-rainfall area is limited mainly by the absence of winter rains. During the coldest winter months, namely, May, June, July and even August, the evaporation of moisture in the soil, as well as the water consumption of the slow-growing wheat plants, is minimal, so that, if sufficient soil moisture was previously available and conditions remain normal during the above-mentioned months, the absence of rain during that period should not restrict the production of wheat to any extent worth mentioning. The period immediately after sowing and the following spring are the critical periods.

Moisture during the Sowing Period.

Adequate moisture is essential when the seed is sown. If good rains fall and the soil has adequate moisture reserves in the lower layers, this will not only promote successful germination, but the low loss of moisture during the mid-winter months will also contribute largely towards keeping the plants alive until well into the spring. Soil intended for wheat should not be ploughed for the first time when the last summer rains fall in April, but should previously be brought into a condition favourable for the absorption of moisture and be kept free of weeds. The risk of bare, cultivated soil being affected by erosion should not be lost sight of, however, and in cases where there is any appreciable slope, the lands should be ploughed along the contour. In addition it is strongly recommended that grass-covered strips should be left unploughed in order to counteract this danger. In the first instance, the ground must be thoroughly ploughed, i.e. grass and weeds should be ploughed well into the soil, since the purpose of this operation will be completely frustrated if

portions of weeds are left showing under each sod. The roughly ploughed condition is most favourable for the absorption of water. A few days after any further rains which will result in the emergence of weeds, the surface of the ground should again be cultivated, preferably with a disc harrow. This practice will to a large extent eliminate the risk of having to depend on ploughing in autumn, and render unnecessary the practice of sowing in dry soil and then waiting for rain, since the seed can be introduced into the moist layers of such soil by means of a wheat planter, thereby ensuring germination. Wheat which germinates and becomes established in March-April, will respond much better to good management than wheat which is sown in dry soil and then left to depend upon rain in winter for germination, or even wheat sown after late rains in winter.

Moisture in Spring.

Wheat which has been established in autumn and has successfully survived the winter with judicious management, is exposed to the risk of drying up when the warm weather arrives in spring and the growing plants consequently require more moisture. It is during this period that moisture reserves in the soil play such a very important part, since the dangers attending a dry spring are much more serious than unfavourable conditions during the sowing period, and are also much more difficult to control. With the stimulus of warm weather the water requirements of the plants are automatically increased. Consequently, if the plants reach the flowering stage without any rain having fallen the prospects for a harvest will be nil.

Suitable Varieties.

For dryland wheat sown in autumn (March-April) " Scheepers " is the most suitable variety, with Red Egyptian as second choice. Both varieties have their weak points, but are reasonably adaptable to existing climatic requirements. The rate of seeding should be 60 to 80 lb. of seed per morgen, if a wheat planter is used, otherwise the seed should be broadcast and cut into the soil with a disc-harrow.

Varieties with a shorter growing period, such as " Bontaar " Union and Gluretty, should not be sown before the beginning of May, but will prove suitable if adequate rain falls in winter. Later in winter, for instance in July and even August, rust-resistance becomes a serious consideration, and varieties such as Kruger and Sterling should then be sown. These late varieties are usually sown thicker since they stool less.

The seed should be disinfected with a mercury preparation (Ceresan, Agrosan, etc.) or copper carbonate. Superphosphate at the rate of 200 to 300 lb. per morgen or an equal quantity of the E4 - 12 - 0 mixture is applied with the planter or ploughed in when sowing.

Management.

The aim should be to have the plants well established before the winter. They should, however, not be too luxuriant and

leafy at this stage, since in this case they will draw too much from the moisture reserves and consequently be too vulnerable to a spring drought. As soon as the plants are well established and there are signs of strong vegetative development before winter, a light grazing is desirable. The plants should be strong, but not too leafy. In like manner any hot period during winter which stimulates the development of foliage should be followed by a light grazing calculated to impede the development of the plants. It stands to reason that such grazing which is designed to control development, becomes particularly important with the onset of spring weather, since it is essential at this time of the year to prevent the plants from sprouting before the possibilities of rain are fairly favourable. It should be understood, however, that grazing when the plants are in the piping stage usually has a deleterious effect, since at this stage the plants have already reached their reproductive phase, and grazing will considerably reduce the yield. The control of development by grazing should therefore be directed mainly at retarding the piping and flowering stage as far as possible, due regard being paid to the species and the prevailing climatic conditions. It may be added here that the grazing normally obtained from wheat sown in Autumn partially or fully compensates for expenses incurred in connexion with cultivation, seed, etc. In view of the fact that the sowing of wheat for cereal purposes is always attended by risks in the dryland areas of the summer-rainfall area, the primary object should be to sow the wheat for winter grazing, the possibilities of a cereal crop being a secondary consideration, to be decided according to the conditions in Spring. If droughty conditions prevail in spring and there is consequently little likelihood of a cereal crop being obtained, the available wheat grazing for animal feeding automatically becomes more valuable. If, therefore, the wheat starts flowering during a period of drought and the moisture reserves in the soil are depleted, it should rather be utilized as grazing.

Purchase of Seed.

The wheat crop of the dryland areas of the summer-rainfall area was exceptionally poor last year and it is not always easy to obtain good seed of the desired kind. The Wheat Industry Control Board announces that although wheat is sold according to class and grade only and not according to variety, it will do its best to furnish producers with the names and addresses of possible suppliers of those varieties for which they may apply. Producers may therefore direct their enquiries regarding seed wheat to the Manager, Wheat Industry Control Board, P.O. Box 908, Pretoria. When making enquiries, producers must state the number of bags of each variety which they require. The Board cannot, however, give any guarantee with regard to the variety or suitability for seed purposes of the wheat which may be supplied to producers.

It will be in their own interests for producers to get into touch with the Board in good time in connexion with their wheat seed requirements.

An Analysis of South African Wool Clips.

Estimated Clean Yields and Prices of Representative South African Wool Clips for the Seasons 1938-39, 1939-40 and 1940-41.

G. S. Maré, Senior Sheep and Wool Officer.

As a result of the war a radical change was brought about in the wool trade at the commencement of the last wool season. Prior to the war and during the first year of the war all wool was sold by public auction and buyers from different parts of the world operated on the local markets.

Just before the commencement of the 1940-41 wool season an agreement was concluded between the British and Union Governments whereby the exportable surplus of the Union clip was sold to the British Government at *fixed prices* for *fixed types*. The agreement will last for the duration of the war and one year after. All other buyers have therefore disappeared from the scene and auction sales are no longer necessary.

There was also an agreement between the two Governments during the 1939-40 wool season, by which the British Government undertook to operate on the Union market on a "fixed price for fixed type" basis. The open market was maintained and sale by public auction took place as usual. A utopian state of affairs existed because the grower was assured of an equitable minimum price basis but had the benefit of open competition. It was indeed a priviliged market.

The 1938-39 season, just before the war, was one of low prices. In fact, prices were about 12 per cent. and 33 per cent. lower than during the 1937-38 and 1936-37 seasons respectively.

Because of the peculiar circumstances which existed during the past two seasons, the writer investigated the relative prices and yields for these two seasons as compared with those during the season which immediately preceded the war.

Method of Investigation.

The method adopted in the investigation was to procure the sales particulars of a large number of individual clips for each of the three successive years. In respect of each clip a careful calculation was made of total grease weight, total clean weight and total gross realization. In this manner it was possible to calculate accurately the average grease price and clean yield for each individual clip for the three successive seasons. By grouping the selected clips into areas, the areas under Ports and, finally, combining the Port figures,

final data were obtained for a large number of clips which accurately reflect the relative price levels and clean yield for the three seasons. It must be emphasized that in all cases the entire clip was brought into account, i.e. outsorts and lox were not excluded.

In the selection of clips the following procedure was followed. The three port areas Durban, East London and Port Elizabeth were divided into a number of sub-areas. Brokers were then asked to make a selection from their particular clients situated in the respective sub-areas. The next step was to extract from the broker's records the complete details for each of the selected clips for each year.

The Durban area was divided into nine sub-areas: three for Natal, two for the Orange Free State, and four for the Transvaal. Thirteen to sixteen clips were selected in each sub-area, making a total of 131 clips.

The East London area was divided into four sub-areas, one for the Orange Free State and three for the Cape, a total of 96 clips. In the case of Port Elizabeth the area was divided into three sub-areas, and 60 clips analysed.

Scope of Analysis.

Altogether 287 clips were included in the analysis, totalling just over 13,000 bales. If the Union clip is taken as 800,000 bales, and if wool taken from the Cape Town area which account for approximately 100,000 bales and all native and Basuto wools are excluded from the analysis, the percentage analysed would be just on 2 per cent.

Clips varying in size from 2 to 279 bales were included, and they were drawn from the main districts serving the respective Port areas.

The figures as presented for each of the three ports should not and cannot be used to compare port with port, since it cannot be claimed that the clips selected at each port are truly representative of the bulk of the wool handled. Their value lies in the fact that they serve as a reliable indication of the trend of prices at each port during the three successive years.

It was fortunate that in their selection the brokers included a fair number of short-wool clips. A classification was made, and in Table I the number and percentages of short-wool clips are shown. In this classification a clip was designated as short-wool when the longest fleeces were typed as 8-10 months.

Table I.—*Number and Percentage of Short-Wool Clips.*

	Port Elizabeth.	East London.	Durban.	Total.	Percentage of Grand Total.
1938–39..........	8	10	6	24	8·4
1939–40..........	6	9	11	26	9·4
1940–41..........	7	5	18	30	10·5
Average..........	11·7 %	8·5 %	9·0 %		

Whereas the short-wool clips were fairly evenly distributed over the sub-areas of Port Elizabeth and East London, the bulk of the Durban short-wools came from one sub-area, viz., the western Transvaal.

In Table II the full particulars for the Durban area are tabulated. This table discloses the following main points:—

(1) There are nine sub-areas with 13-16 clips in each, and a total of 131 clips representing just over 4,000 bales.

(2) The number of bales per clip varies greatly in the different sub-areas, being smallest in area 6, and largest in areas 4 and 9. The average size of the clips is approximately 31 bales, but clips of all sizes were included.

(3) In respect of clean yield there is a tremendous variation ranging from 36·83 per cent. for area 6 to 50·65 per cent. for area 2. The clean yields for the 1940-41 season are consistently higher than those for 1938-39, ranging from ·08 to 4·73 per cent., and in most cases the yields for the 1939-40 season are in turn higher than those for 1940-41, ranging from −1·03 to +5·95 per cent. On an average, the 1939-40 yield is 1·06 per cent. higher than 1940-41 yield which, in turn, is 2·21 per cent. higher than the 1938-39 yield.

(4) In respect of grease price per lb. some areas outstrip others by almost 60 per cent. (*vide* areas 2 and 6 for the 1938-39 season). The average grease prices for the three seasons are: 8·84, 13·26 and 12·04 pence. A substantially higher price was therefore realized during the 1939-40 season.

(5) Expressed on a percentage basis, the 1940-41 average price is 36·21 per cent. higher than the 1938-39 figure, and 9·2 per cent. lower than the 1939-40 figure.

The data in Table II therefore prove that for the season 1939-40 higher yields and a higher price per lb. were obtained than during the other two seasons, and that for the last season the yield was 2·21 per cent. higher than for the pre-war season.

The substantially higher price for the 1939-40 season may be attributed to the fact that the British Wool Commission concentrated its open-market buying at Durban.

In Table III the figures for East London are given. Four sub-areas are dealt with, a total of 96 clips comprising just over 4,000 bales. This table reflects the following position:—

(1) In respect of clean yield the 1939-40 figures are consistently higher than the 1938-39 figures, and the 1940-41 figures are in advance of the 1939-40 figures, except for sub-area 3. In the average figure there was an increase of 2·09 per cent. in two years.

TABLE II.—*DURBAN AREA*: (*a*) *season* 1938-39; (*b*) *season* 1939-40; (*c*) *season* 1940-41.

	Year.	Area 1.	Area 2.	Area 3.	Area 4.	Area 5.	Area 6.	Area 7.	Area 8.	Area 9.	Totals and Averages.
Number of clips	a. b. c.	14 14 14	15 15 15	14 13 14	15 15 15	12 13 [illegible]	14 14 14	16 16 16	14 12 14	16 16 16	131 128 131
Number of bales	a. b. c.	516 520 504	414 412 394	345 314 365	889 971 901	233 22[illegible] [illegible]	[illegible]63 [illegible]08 [illegible]60	319 359 353	290 252 266	904 952 825	4,073 4,214 4,006
Grease weight (lb.)	a. b. c.	161,099 154,793 156,123	112,986 111,468 108,032	106,090 94,782 122,880	287,905 298,354 299,243	76,247 73,558 83,416	57,[illegible]06 68,[illegible]02 59,95[illegible]	106,823 111,775 117,935	85,027 74,131 86,392	278,532 287,025 275,856	1,272,405 1,274,578 1,309,861
Clean weight (lb.)	a. b. c.	74,987 76,683 75,956	57,230 58,844 58,143	50,064 46,748 60,006	132,508 148,857 143,937	31,265 32,745 35,651	21,251 29,444 22,140	44,353 52,039 54,545	41,005 36,548 42,692	134,463 147,657 140,379	587,126 629,565 633,449
Value in pence	a. b. c.	1,461,788 2,059,839 1,897,720	1,159,500 1,550,545 1,504,221	958,509 1,305,714 1,465,144	2,492,529 3,974,363 3,586,867	555,733 844,335 843,011	352,440 654,594 483,868	790,656 1,313,212 1,317,422	802,640 1,029,134 1,079,020	2,687,953 4,177,751 3,596,647	11,261,748 16,909,490 15,772,079
Range in bales per clip	—	17—74	9—60	2—48	12—166	3—46	5—31	7—62	8—37	12—202	—
Clean yield (%)	a. b. c.	46·55 49·54 48·65	50·65 52·79 53·82	47·19 49·32 48·83	46·02 49·89 48·10	41·00 44·52 42·74	36·83 42·86 36·91	41·52 46·56 46·25	48·[illegible] 49[illegible] [illegible]	48·28 [illegible]1·44 [illegible]0·89	46·14 49·39 48·36
Grease price (d./lb.)	a. b. c.	9·07 13·31 12·16	10·26 13·91 13·92	9·03 13·78 11·92	8·66 13·32 12·00	7·29 11·48 10·11	6·11 9·53 8·07	7·40 11·7[illegible] 11·17	[illegible] [illegible]·88 12·49	9·65 14·56 13·04	8·85 13·27 12·04
Percentage increase in grease price— b/a c/a c/b	 — — —	 46·65 33·96 — 8·66	 35·55 35·68 0·10	 52·48 31·97 —13·45	 53·88 38·58 — 9·94	 57·49 38·66 —11·96	 56·00 32·05 —15·35	 [illegible] [illegible] — 4·92	 47·06 32·31 —10·03	 50·83 35·10 —10·42	 49·94 36·05 — 9·27

Area 1—Matatiele, Kokstad, Underberg, Himeville, Donnybrook.
Area 2—Estcourt, Greytown, Bergville, Nottingham Road, Mooi River.
Area 3—Piet Retief, Paulpietersburg, Newcastle, Memel, Dundee.
Area 4—Harrismith, Vrede, Bethlehem.
Area 5—Vredefort, Kroonstad, Senekal, Reitz, Frankfort, Heilbron.
Area 6—Bloemhof, Wolmaransstad, Klerksdorp, Lichtenburg, Potchefstroom.
Area 7—Witbank, Bethal, Morgenzon, Heidelberg, Standerton.
Area 8—Lydenburg, Belfast, Carolina.
Area 9—Wakkerstroom, Volksrust, Amersfoort, Ermelo, New Scotland.

TABLE III.—*EAST LONDON AREA: (a) season* 1938-39; *(b) season* 1939-40; *(c) season* 1940-41

	Year.	Area 1.	Area 2.	Area 3.	Area 4.	Totals and Averages.
Number of clips.........	a.	23	19	30	24	96
	b.	21	19	28	23	91
	c.	23	19	30	24	96
Number of bales........	a.	677	638	1,774	1,334	4,423
	b.	622	765	1,512	1,498	4,397
	c.	720	753	1,755	1,451	4,679
Grease weight (lb.)......	a.	207,652	212,992	587,654	431,672	1,440,270
	b.	184,931	236,004	468,478	446,367	1,335,780
	c.	233,354	232,686	572,663	454,661	1,493,364
Clean weight (lb.).......	a.	93,388	96,080	267,158	201,005	657,631
	b.	84,292	108,209	215,120	211,287	618,908
	c.	108,540	113,567	262,683	228,226	713,016
Value in pence..........	a.	1,666,709	1,910,321	5,124,199	4,140,399	12,841,528
	b.	2,057,305	2,754,013	5,643,988	5,346,955	15,802,261
	c.	2,733,349	2,839,444	6,674,959	5,811,583	18,059,335
Range in bales per clip..	—	7—104	13—97	8—216	15—186	—
Clean yield (%).........	a.	44·97	45·11	45·46	46·56	45·66
	b.	45·58	45·85	45·92	47·33	46·33
	c.	46·51	48·81	45·87	50·20	47·75
Grease, price (d./lb).....	a.	8·03	8·97	8·72	9·59	8·92
	b.	11·12	11·67	12·05	11·98	11·83
	c.	11·71	12·20	11·66	12·78	12·09
Percentage increase in grease price.......b/a	—	38·48	30·12	38·16	24·92	32·62
c/a	—	45·83	36·06	33·67	33·26	35·54
c/b	—	4·55	4·56	— 3·25	6·70	2·20

AREA 1—Brandfort, Reddersburg, Dewetsdorp, Edenburg, Rouxville, Smithfield, Trompsburg.
AREA 2—Aliwal North, Burghersdorp, Lady Grey, Molteno, Steynsburg.
AREA 3—Barkly East, Elliot, Sterkstroom, Dordrecht.
AREA 4—Tarkastad, Cathcart, Queenstown, Adelaide, Komgha, Stutterheim.

(2) In respect of prices the position is the same as that in respect of yields. The average increase on the pre-war price was 3·19d. or 35·54 per cent. The southern O.F.S. sub-area actually showed a 45·83 per cent. increase.

In Table IV the figures for Port Elizabeth are analysed.

A total of 60 clips is shown, comprising mostly large clips. The total number of bales is just under 5,000, the average size of the clips dealt with being about 80 bales.

As in the case of East London the yield and price per lb. are consistently higher for successive seasons. The average price realized

for the 1940-41 season was 13·02d. per lb. as compared with 9·71d. per lb. for the pre-war season, an increase of 34·09 per cent.

In Table V the figures for all three Ports are summarized.

This table reflects the following:—

(1) Altogether 287 clips, comprising some 13,000 bales, were analysed for three successsive years.

(2) The clean yield was consistently higher in successive seasons except Durban.

(3) The price per lb. was also consistently higher in successive seasons, except at Durban.

TABLE IV.—*PORT ELIZABETH AREA: (a) season* 1938-39 (*b*) *season* 1939-40; (*c*) *season* 1940-41.

	Year.	Area 1.	Area 2.	Area 3.	Totals and Averages.
Number of clips.........	a.	28	17	15	60
	b.	26	17	15	58
	c.	28	17	15	60
Number of bales.........	a.	1,950	1,122	1,354	4,426
	b.	1,957	1,154	1,709	4,820
	c.	2,210	1,196	1,457	4,863
Total grease weight (lb.)..	a.	612,616	362,820	418,471	1,393,907
	b.	619,005	369,034	528,828	1,516,867
	c.	678,377	388,468	462,372	1,529,217
Total clean weight (lb.)...	a.	313,583	162,185	193,790	669,558
	b.	325,040	173,283	245,964	744,287
	c.	357,568	180,559	221,436	759,563
Total value in pence.....	a.	6,601,118	3,089,148	3,839,468	13,529,734
	b.	8,492,462	4,418,684	6,536,057	19,447,203
	c.	9,692,789	4,497,850	5,722,813	19,913,452
Range in bales per clip..	—	8—279	30—145	25—238	—
Clean yield (%).........	a.	51·19	44·70	46·31	48·03
	b.	52·51	46·96	46·51	49·07
	c.	52·71	46·48	47·89	49·67
Grease price (d./lb.).....	a.	10·78	8·51	9·17	9·71
	b.	13·72	11·97	12·36	12·82
	c.	14·29	11·58	12·38	13·02
Percentage increase in grease price.......b/a	—	27·32	40·70	34·71	32·03
c/a	—	32·60	36·06	34·90	34·09
c/b	—	4·14	3·30	0·14	1·56

AREA 1—Humansdorp, Steytlerville, Pearston, Somerset East, Bedford, Tarkastad, Grahamstown, Adelaide.
AREA 2—Aberdeen, Graaff-Reinet, Hanover, Colesberg, Murraysburg, Cradock.
AREA 3—Beaufort West, Carnarvon, Victoria West, Williston, Prieska, Britstown, De Aar Richmond.

(4) The price last season was 35·48 per cent. higher than the pre-war season, but 1·82 per cent. lower than the 1939-40 season.

Table V.—*SUMMARY OF ALL THREE PORTS: (a) season* 1938-39; *(b) season* 1939-40; *(c) season* 1940-41.

	Year.	Port Elizabeth.	East London.	Durban.	Totals and Averages.
Number of clips.....	a.	60	96	131	287
	b.	58	91	128	277
	c.	60	96	131	287
Number of bales....	a.	4,426	4,423	4,073	12,922
	b.	4,820	4,397	4,214	13,431
	c.	4,863	4,679	4,006	13,548
Total grease weight (lb.)	a.	1,393,907	1,444,270	1,272,405	4,110,582
	b.	1,516,867	1,335,780	1,274,578	4,127,225
	c.	1,529,217	1,493,364	1,309,861	4,332,442
Total clean weight (lb.)	a.	669,558	657,631	587,126	1,914,315
	b.	744,287	618,908	629,565	1,992,760
	c.	759,563	713,016	633,449	2,106,028
Total value in pence.	a.	13,529,734	12,841,528	11,261,748	37,633,010
	b.	19,447,203	15,802,261	16,909,490	52,158,954
	c.	19,913,452	18,059,335	15,772,079	53,744,866
Clean yield (%).....	a.	48·01	45·66	46·14	46·57
	b.	49·07	46·33	49·39	48·28
	c.	49·67	47·75	48·36	48·61
Grease price (d./lb.)..	a.	9·71	8·92	8·85	9·16
	b.	12·82	11·83	13·27	12·64
	c.	13·02	12·09	12·04	12·41
Percentage increase in grease price....b/a	—	32·03	32·62	49·94	37·99
c/a	—	34·09	35·54	36·05	35·48
c/b	—	1·56	2·20	— 9·27	—1·82

In conclusion it should be stated that the lowest percentage increase in price for any of the sub-areas was 31·97, and since the price schedule on which the Union clip is appraised was based on an approximate 32 per cent. increase on pre-war prices, the figures and analyses as submitted in this article point to the fact that the prices as scheduled are extremely close to what they were intended to be.

ACKNOWLEDGEMENTS.

The writer wishes to tender his sincere thanks to those wool brokers who so willingly co-operated in this work, as well as to the wool inspectors and other officers of the Department of Agriculture and Forestry who assisted in compiling the data.

Winter Crops and Army Worms.

THE Transvaal and northern Orange Free State have just experienced a severe outbreak of army worms which have caused considerable damage to grass crops, such as teff, etc. In some cases, mealies have been attacked and on some farms the veld has been seriously affected. Three generations of the insect have been mainly responsible for this damage, and the worms are now full-grown again and ready to enter the soil to pupate. From the pupae in the soil another generation of moths is likely to emerge, but because the weather is now getting cooler, the moths will not emerge for about three weeks or more.

In the past bad army-worm outbreaks have occurred in South Africa at intervals of about six years, and no outbreaks have been known to occur in two or more successive seasons. It is therefore unlikely that a severe outbreak will occur next summer. It is also known that the insect is very exacting in in its requirements, and that it needs the right conditions of weather and grass growth, in order to multiply and become a pest. When nights are cool, as they are likely to be after the first week in April, the moth cannot lay many eggs, and by that time the grass will be too hard and mature for the caterpillars to feed on. It can safely be assumed, therefore, that the army-worm outbreak in most parts of the country has come to an end for the present.

Having regard to the foregoing and the fact that the country urgently requires more foodstuffs, farmers are urged to put in as much winter crops as possible. There is very little, if any, danger from the army-worm and farmers should not on that account hesitate to grow winter feed and vegetables.

(*Division of Entomology.*)

Nursery Quarantines.

The following quarantines were in force on 1 March 1942:—

(1) Alkmaar Estates, Alkmaar, on citrus (all), for red scale.

(2) Municipal Nursery (Fountains), Pretoria, on ornamentals (part), for pernicious and white peach scales.

(3) Kildare Nurseries, Pietermaritzburg, on apples (part), for red and pernicious scales.

(4) Subkleve's Nurseries, Johannesburg, on deciduous fruit trees (part), for pernicious scale.

(5) Page's Nurseries, Fransch Hoek, on citrus (all), for red scale.

Protected Trees.

In view of the reckless destruction of certain types of trees in various districts of the north-western Cape Province, it was considered necessary to take steps for their protection. Provision was therefore made in the new Forest and Veld Conservation Act (Act No. 13 of 1941), authorizing the Governor-General to protect certain types of trees by proclamation.

The first step in this direction has already been taken by the promulgation of Proclamation No. 214 of 1941 by which the cutting of baobab trees on any land in the Union, not being Crown forest, is prohibited, as also the cutting of any of the following species of trees, viz., vaalbos, camel thorn, mimosa, withaak, swarthaak, karree and witstam, except for domestic use, in the districts of Barkly West, Hay, Herbert, Kimberley, Kuruman, Mafeking, Taungs and Vryburg.

According to Government Notice No. 1630 of 1941, any person wishing to cut down any of the above-mentioned trees should apply for permission to the Minister of Agriculture and Forestry, through the Director of Forestry, P.O. Box 334, Pretoria, from whom further particulars are obtainable.

External Parasites of Sheep.

II. Lice and Ticks.

R. du Toit, Veterinary Research Officer, Onderstepoort.

As far as sheep are concerned, especially Merino sheep, lice do not play a very important part in the ordinary course of events In very dry years, however, and particularly in winter, when animals are in very poor condition, lice may become a menace, especially amongst the haired and bastard classes of sheep.

The lice which play the biggest part are the so-called blue lice, which fall into the order *Siphunculata*, or sucking lice. These lice, which are greyish white in colour in the unengorged state, are provided with complex mouth parts which enable them to pierce the skin of their hosts and suck blood, after which they assume a bluish colour. A further type of louse which is met with on sheep is the so-called red louse, which falls into the order *Mallophaga*, or biting lice. The red louse has a blunt snout in which a well-developed pair of mandibles can be made out under the microscope, and, unlike the blue louse, this parasite does not pierce the skin of its host, but lives on the scales and superficial layers of the skin.

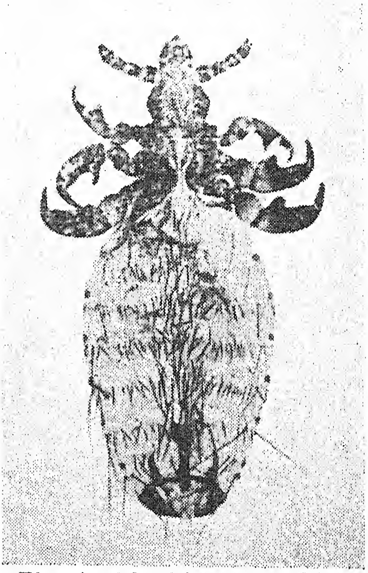


Fig. 4.—The Blue or Sucking Louse.

The species of blue lice met with in the Union are *Linognathus africanus* Kellog and Paine (Fig. 4), and *Linognathus pedalis* (Osborn). The first of these two is found all over the body, whereas the latter species occurs principally on the legs of sheep. Only one species of biting louse occurs on sheep in the Union, namely, *Bovicola ovis* (Linnaeus) (Fig. 5), but a species, *Bovicola peregrina* (Taschenberg), has been recorded from fat-tailed sheep in South-West Africa.

Description and Life Cycle.—Lice are extremely small insects which are flattened from above to below, and are adapted to a purely parasitic existence. The body is roughly an elongated oval in outline, and is more pointed in front in the sucking lice than in the biting lice. The body is divided into three distinct portions, a head, thorax and abdomen, and the three pairs of legs which are carried on the thorax are provided with strong claws, which

enable the insect to retain a very firm grip on the hairs of its host. The integument of the louse is tough and leathery, making it fairly difficult to crush the insect by pressure. Lice are remarkably specific in their choice of host, and the various species are generally not capable of existing on any but the particular host to which they are adapted. The whole life cycle is completed on a single host and the insect is not capable of living away from its host for more than a few hours.

The eggs are minute, greyish-white or yellowish oval objects rounded at one end and flattened at the other. They are laid singly on the hairs of the host and glued firmly into an oblique position by a sticky substance secreted by the female. The eggs are generally referred to as nits. The life cycles of the various species of lice occurring on animals have not been worked out precisely, and would probably differ somewhat from that of the well-known human louse, but the various stages are essentially the same. In the case of the human louse the egg hatches in anything from 5 days to about 6 weeks, depending upon temperature and moisture. The larvae closely resemble the adults, except for size and the absence of a genital opening. After a moult the first nymphal stage appears, which is followed by a second nymphal stage, both these stages showing no marked difference from the larval stage except in slightly increased size. The period from larva to adult occupies 11 to 13 days, and the average time the adult spends on the host is roughly 3 to 4 weeks, during which period the female lays slightly more than 100 eggs.

Symptoms.—In dry seasons and particularly in the winter months, when animals are in poor condition, lice may increase enormously in numbers until the skin becomes literally covered with them. Large numbers of eggs are laid on the wool or hair and these, together with the dry scaly appearance which the skin assumes and the blackish dried excreta of the lice, give the fleece a very dirty, ragged appearance. The wool suffers very materially in texture and quality and the fibres become thinned and harsh. Lousiness is associated only with animals in poor condition and the infestation tends to debilitate such animals still further by reason of the loss of blood occasioned by the parasites. The irritation set up by their bites is responsible for considerable rubbing against objects and results in the loss of much hair in the case of the haired sheep.

Prevention and Cure.—As close contact is responsible for the spread of infection amongst sheep, this is to be avoided as far as possible. Secondly, the condition of sheep plays an important part and even if lice should get on to well-conditioned animals, they will not multiply to any great extent so long as the good condition is maintained. The running of sheep in jackal-proofed camps, where the sheep are not herded, tends to keep them apart and, generally speaking, sheep do better under these conditions and are better able to withstand lice infestation. Although the eggs are capable of hatching away from the host, they are so well attached to the hair that they are rarely dislodged.

Dipping constitutes the only reliable method of combating lice infestation. Carbolic dips have been found to give the best results,

whereas arsenical dips, although fairly satisfactory against biting, are of little value against the sucking variety, unless supplemented by the addittion of some lice-destroying preparation. Such supplementary preparations are available to-day and are very effective, but moderate results may be obtained by the addition of a small quantity of paraffin to the dip which must be renewed during dipping when the oily film on the surface commences to disappear. Sometimes it is not possible to use carbolic preparations because the water is so hard that it interferes with emulsification. In such cases tobacco-extract dips are recommended which show a very high degree of efficacy.

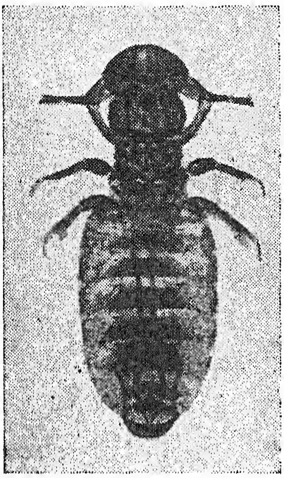


Fig. 5.—The Red or Biting Louse.

The Spinose Ear Tick.

The spinose ear tick, *Argas megnini* (Dugès), as its name implies, is found in the ears of its host, and sheep are frequently affected by it. It belongs to the family *Argasidae* which includes the fowl tampan, *Argas persicus*, and the human or eyeless tampan *Argas moubata*. The larval and nymphal stages occur only in the ears and it is from the short upright spines covering the body of the nymph that the appellation spinose is derived.

Distribution and Life History.—The spinose ear tick (Fig. 6) occurs in the drier parts of the country and is most commonly met with in the northern portions of the Cape Province, in the Orange Free State and in Bechuanaland. Of recent years, however, it has shown a tendency towards spreading over many parts of the country and to-day it is not at all uncommon in Natal and the Transvaal. It is essentially a kraal infestation and it must be considered a rare occurrence for animals to become infested on the open veld where, as will become evident from the life history, the parasite stands rather a meagre chance of existing.

The eggs are laid in cracks and crevices in kraal or stable walls where they hatch into minute six-legged larvae in from 22 to 56 days. The larvae crawl actively in search of a host and immediately enter the ears where they attach themselves and commence feeding. They are capable of living from one to four months if they cannot find a host. Engorgement occupies a period of from 5 to 10 days, during which they swell enormously and become small, whitish or pinkish pear-shaped bodies on which the legs are scarcely visible. They are incapable of movement. Moulting takes place in the ear to the eight-legged nymphal stage. The nymphs attach themselves at once, and feeding, which occupies a variable period, may be complete in as short a period as one week or as long as three months or even longer. The nymph (Fig. 6) is yellowish-white to start with, but rapidly assumes a bluish-grey colour. The body is at first widest in the centre but, as engorgement proceeds, it assumes the shape of the body of a violin with a constriction in the middle. When

engorgement is complete, the nymphs leave the ear to moult to the adult stage in cracks, crevices, etc., in a period of from 7 to 31 days. The parasitic phase of the life history is now complete as, due to only partial development of the mouth parts, the adults are not capable of piercing the skin with the proboscis and, therefore, do not feed. The adult stage closely resembles the fully engorged nymph, from which it can be easily distinguished, however, by the presence of the genital opening on the lower surface and the fact that the skin is covered with minute pits. Mating takes place after the sexes have found each other, and this may occur after moulting or a period of a year or possibly longer may elapse. Egg-laying commences about a week after the sexes have paired.

From the above description of the life history it is obvious that the spinose ear tick has a much better chance of surviving in the more or less confined space of a kraal or stable than in the open, as the act of mating occurs away from the host and it is necessary for the sexes to find each other, which would be almost impossible in the open veld.

Symptoms.—Sheep affected with spinose ear ticks lose condition rather rapidly and may be noticed frequently to shake the head which is held low or twisted to one side. They frequently kick at the ears in an endeavour to allay the irritation. In heavy infestations the cavity of the ears often becomes filled with a waxy material and the shed skins of larvae and first and second stage nymphs. Where only a few ear ticks are present, they are frequently so deep-seated as to be difficult to discover, but if the ear is carefully probed they are easily found. Instances are on record where ear ticks have penetrated the ear drum and set up infections in the middle ear which have proved fatal to sheep.

Prevention and Treatment.—Preventive measures consist in thoroughly inspecting the ears of all classes or species of animals introduced on to a farm for the presence of spinose ear ticks. It is good policy to make a routine of treating the ears of all such animals immediately upon arrival, as failure to do this might result in engorged nymphs dropping from the ears and setting up a focus of infestation which will be extremely difficult to eradicate later on.

Premises which have become infested are extremely difficult to clean on account of the resistance of this species of tick to disinfectants and its inaccessibility in the cracks and crevices of walls built with unplastered stone or blocks of manure, which are common building practices in South Africa. Sprays are of little value, for in most cases the ticks cannot be reached by fluids. Brushwood or other combustible material may be packed inside and against kraal walls and burnt and the infestation may be considerably reduced by this means. Where a kraal is badly infested, it should be fenced off and no animals should be allowed access to it. It is difficult to state the period which the spinose ear tick is capable of existing away from a host as cases have frequently been brought to our notice where animals have acquired the tick in premises isolated for periods of three years and possibly longer.

Treatment consists in dressing the ears of infested animals with substances capable of killing the immature stages and preventing

re-infestation for as long a period as possible. The following mixture has been found to give good results and affords protection against re-infestation for about one month:—2 parts cotton-seed oil or old motor oil, 2 parts Stockholm tar and 1 part turpentine, by volume. This mixture is poured into each ear, about 1 teaspoonful per ear, and the ear is massaged between the fingers to ensure good penetration. Care should be taken not to allow the remedy to run over the skin of the head or to get into the eyes as it is very irritating. The ears should be inspected monthly or at three-weekly intervals and the treatment repeated when necessary.

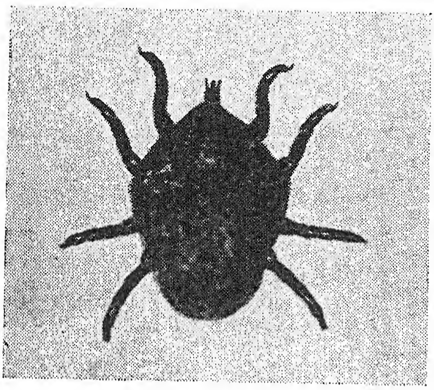


Fig. 6.—The Spinose Ear Tick. Young Nymph.

The Sheep Paralysis Tick.

The term paralysis tick is applied in this country to two species of ticks which are capable of producing paralysis in sheep and other domestic animals. The ticks involved are *Ixodes pilosus* Koch (Fig. 7), also known as the bush or russet tick, and *Ixodes rubicundus* Neumann, known as the Karroo paralysis tick or hill tick.

Description.—The two species are not easily distinguished from each other except under a microscope, but they differ considerably in their distributions. Both are small, reddish-brown species approximately ⅛ inch in length in the unengorged state, oval in outline, and eyes are absent. The male possesses a hard shield which entirely covers the upper surface of the body and is characterized by the presence of a deep lateral groove which leaves a distinct rounded ridge along the margin of the body. The female is approximately of the same size as the male in the unengorged state, with a small shield at the front end of the upper surface and the remainder of the body, which is sac-like and capable of great distension, she possesses fairly numerous whitish hairs. The legs are brown in both sexes and comparatively slender. The engorged female is roughly ⅜ inch in length, bluish in colour and presents a slightly elongated sphere in shape, more pointed in front with the legs and mouth parts appearing somewhat crowded at the anterior extremity. The palps are long and flexible.

Distribution.—*Ixodes pilosus* Koch is more commonly met with in grassveld and appears to be commonest along the coastal belt of the eastern Cape Province and Natal.

Ixodes rubicundus Neumann, on the other hand, is encountered principally on the stony hills of the Karroo and is common in the Middelburg district where it presents a serious menace to sheep farming in some areas. The eastern slopes of such Karroo hills, which catch the moring sun, appear to be most heavily infested.

Life History.—These two species of ticks may be regarded as winter ticks in that they are most prevalent from about March to September. To reach maturity these ticks require three hosts. The six-legged larval stage, in which engorgement occupies approximately 2 to 3 days, and the eight-legged but sexually immature nymphal stage, in which engorgement occupies about 4 days, occur on small wild animals such as hares, field mice and rats, whereas the adults, in which the female engorges herself in 5 to 6 days, are found on sheep and larger animals.

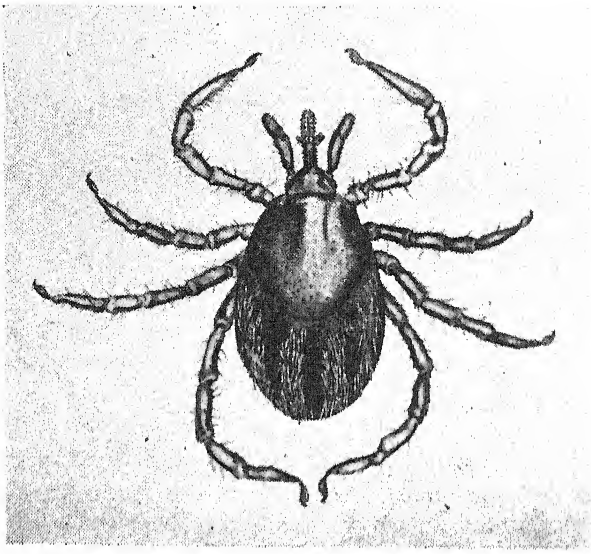


Fig. 7.—The Sheep Paralysis Tick. Adult Female (Unengorged).

The adults attach themselves chiefly to the more or less hairless portions of the body of sheep, such as the legs and under-surfaces of the belly and more rarely on the head and neck. In haired sheep the ticks are occasionally encountered on the body.

As the name indicates, these two species of ticks are capable of causing paralysis in sheep, which, if not attended to, can lead to a large number of deaths in a flock. The female only is responsible for such paralysis, and although the cause is not clearly understood, it would appear that, while the tick is attached, some toxic substance is slowly injected into the animal. Only certain females are capable of producing this paralysis and it has frequently been observed that animals literally covered with paralysis ticks show no ill effects, whereas animals may show severe paralysis with only one or two ticks on them. It has been noted in Australia that, in the case of a closely allied species capable of producing paralysis in animals, only those female ticks showing a marked increase in the size of the salivary glands are associated with paralysis.

Prevention and Control.—There is little likelihood of paralysis ticks being eradicated, as it is not possible to control the immature ticks on small wild animals but in so far as the presence of adult ticks on sheep are concerned, a great deal can be done by means of a foot bath. As has been pointed out, the ticks occur on the legs and lower parts of the bodies of sheep, and use has been made of this fact in designing the foot bath so as to obviate the necessity of having to immerse the animals in a tick-destroying solution; a procedure impossible of application in winter on sheep carrying a heavy fleece.

Foot Bath for Sheep.—The foot bath (Fig. 8) is a shallow, concrete dipping tank or trough 36 feet long by $2\frac{1}{2}$ feet deep by 15 inches wide at the bottom and 18 inches wide at the top. Arsenite of soda solution, in the proportion of 2 lb. sodium arsenite to every

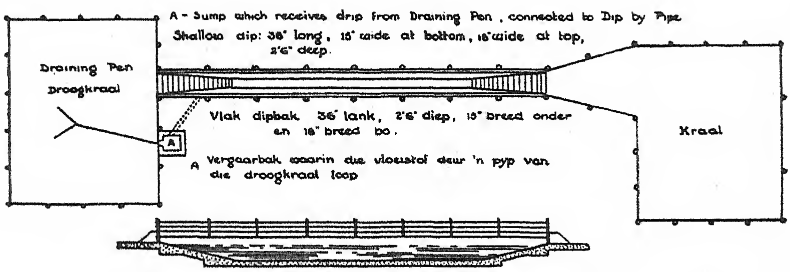


Fig. 8.—The Foot Bath for Sheep.

100 gallons of water, is run in to a depth of 16 inches. This is deep enough to reach to the bellies of the sheep, and the animals are allowed to walk through this tank at regular intervals. In the case of severe infestations, it is often advisable to send the sheep through once every seven days, but, as a rule, fortnightly or even three-weekly intervals suffice in the winter months, and excellent results have been reported. In areas where tick paralysis is prevalent, the practice of applying the foot-bath method is advisable between the months of March to August or September annually, whether the ticks appear to be present or not, as failure to observe such precautionary measures may led to sudden and severe losses.

Sheep affected with paralysis should be carefully examined for the presence of ticks, and such ticks must be removed at once. After the removal of the ticks responsible for the condition recovery generally follows at once, but in cases of long standing improvement may be much delayed, and careful nursing, with the administration of gruels for the maintenance of strength, may be necessary before a cure is effected.

The Bont-legged Tick.

Of the other species of ticks which are met with on sheep, the bont-legged tick is undoubtedly the most important. Two varieties are found in the Union, namely, *Hyalomma aegyptium var. impressum* and *H. a. var. aegyptium*. Occasionally, species of brown

ticks occur between and around the claws, but the effects produced by them are similar though milder than those produced by the bont-legged tick, and the control measures employed are the same.

Description and Life History.—The bont-legged tick (Fig. 9) is a large species, characterized by a dark-brown or black shield which covers the whole of the upper-surface of the body of the male and the front third of the female. The mouth parts are long and the legs in both sexes are banded with white or yellowish bands at the joints.

This tick falls into the category of two- or three-host ticks, the adults occurring only upon sheep and other domestic animals, whereas the immature stages are met with on small field animals, principally field rats and mice. On these small field animals the larval stage may drop from its host and moult to the nymph on the ground, or moulting may occur on the host. The adults attach themselves to the more hairless portions of the body, e.g., around and between the claws, behind the shoulders, and very frequently on the tails of the fat-tailed varieties of sheep, where they engorge themselves in a period of from 6 to 8 days. The adult females lay from 10,000 to 15,000 eggs on the ground after dropping from their hosts, and both sexes are capable of resisting starvation in the unengorged state for periods of up to 2 years.

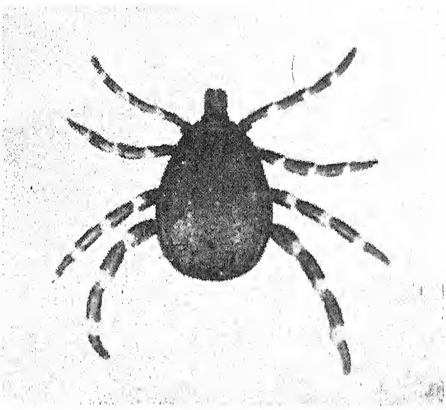


Fig. 9.—The Bont-Legged Tick.

Distribution and Effects Produced.—This species has a very wide distribution in the Union, but is typically a species of the drier parts and is abundant in Bechuanaland and the north-western portions of Cape Province. Although it is not associated with the transmission of any specific disease in sheep, it is capable of producing deep, painful lesions, on account of its long mouth parts, and these lesions lead to severe lameness. Such lesions, which are surrounded by a zone of inflammation, are liable to be invaded by various organisms and also by blowflies, whose maggots readily cause considerable extensions to the initial wound produced by the tick. The bont tick is frequently associated with footrot in sheep, which is caused by the necrosis bacillus invading the tick bites situated around the coronets and thus gaining entrance to the soft tissues of the feet.

Prevention and Control.—On account of the long mouth parts which are deeply embedded in the tissues of the host, it is not advisable to remove the bont tick forcibly as the mouth parts are liable to remain behind and lead to suppuration. Such attached ticks are best treated by means of a hand-dressing material consisting of an oil or grease containing carbolic, nicotine or some other insecticide, and of which many suitable preparations are obtainable. Where the feet and lower portions of the body are infested, the

foot bath described for the control of the paralysis tick gives excellent results, and it is by far the most satisfactory method to employ in a flock where individual ticks on the feet are difficult to find until lameness or severe suppuration manifests itself.

Note.—Parasitism by the larvae of blowflies and nasal flies are dealt with in other departmental publications.

First Allotment of Guano.

The Department has to announce that owing to prolonged unfavourable climatic conditions along the entire west coast of the Union during the latter part of last year, guano-producing birds were late in taking to the islands for breeding, so that the collection of guano has been delayed.

Owing to the lateness of the breeding season and the scarcity of birds it is expected that the yield of guano will be below normal. Furthermore, deliveries to farmers can be made only from April onwards. Applicants have already been advised to this effect and informed of the number of bags alloted to them .

Useful Bushveld Trees and Shrubs.—

[*Continued from page* 239.

the trunks as fire-wood has resulted in parts of the Vryburg district and Griqualand West being very nearly transformed into a desert.

Cattle farmers in the ranching areas should do everything in their power to prevent the cutting down of trees and to encourage the planting of trees which will serve as feed for cattle. This will enable their descendants to carry on with this type of farming in these areas. Should this, however, be neglected, farming in the ranching areas will in the future become even more uncertain as a result of droughts and the scarcity of feed.

Appendix.

The following analyses, kindly made by Dr. A. I. Malan and Mr. P. N. H. Hugo at Onderstepoort, indicate the monthly variations in the crude protein, crude fibre, phosphorus and calcium content of the plants.

The writer wishes to express his sincere thanks for their kind co-operation.

Agro-Economic Survey in the Union.

First Review of Sub-division into Farming Areas.

Compiled by Dr. J. F. W. Grosskopf and G. J. C. Uys, Division of Economics and Markets.

AS every farmer knows, any type of farming cannot be successfully practised just anywhere. The type best suited to a given locality is determined primarily by:

(a) physical factors which embrace topography or surface configuration, soil, climate and particularly rainfall;
(b) biological factors such as diseases and pests in livestock and crops;
(c) economic factors which include market and transport facilities, prices, comparative costs; and
(d) historical factors, as for example, established practices.

On no two farms will the effects of the above-mentioned factors be manifested in exactly the same measure or to precisely the same extent. Nevertheless, there are smaller or larger regions of this country which are suited more particularly to the cultivation of certain crops or to the rearing of certain kinds of stock and which can be distinguished from the surrounding region by a fairly high degree of homogeneity and a distinctive form or composition of the farming enterprise.

Object of the Investigation.

The agro-economic regional survey is intended mainly as a classification which will allow of a better idea being gained and a more effective survey being made of the agricultural structure of this country. This preliminary classification into areas has been broadly conceived in order to bring out in relief and to depict by way of important and striking contrasts the various areas composing the agricultural structure of the Union. An "agro-economic area" is therefore regarded as a part of the country which by reason of its physical, biological, economical and historical characteristics is more or less *homogeneous*, with the result that a distinctive system of farming has developed in that locality. Such an area should be large enough to constitute an important factor by itself in the agricultural-economic structure of the country. In order to conform to this requirement, it is often necessary to group small areas, which actually possess quite distinctive features, into one agro-economic area showing a certain degree of homogeneity in so far as the main features are concerned, but differing sufficiently from the surrounding areas to justify its being treated as a separate entity. Minor differences and exceptions cannot be taken into account.

Although the system of farming practised in a particular area is usually the outcome of the underlying physical, biological, economic and historical factors, the system itself does not always serve as an indication or criterion of the basic differences between

areas. So, for instance, a temporary market created as a result of the presence of a military camp or the construction of irrigation works may temporarily transform the farming system of the vicinity; conversely, the application of a fertilizer to soil of a poor area may produce a system of farming similar to that in an area with rich soil. For this reason the existing farming system was not regarded as the alpha and omega in determining and describing agro-economic areas, but an endeavour has been made to penetrate to the underlying factors amongst which the physical factors particularly are practically unchangeable. Where an area is determined by physical factors, its boundaries will remain unchanged for all time.

The aim of this survey is in the first place to demarcate typical agricultural areas (gradually their sub-areas as well), and also to determine their geographical boundaries; and in the second place, to analyse and describe their agro-economic structure.

In the past this knowledge was to a large extent based on personal experience which, from the nature of the case, was mostly confined to certain localities. Even in cases where persons possessed a sound knowledge of the agro-economic structure of large areas of the country by reason of the nature of their work, their knowledge was not made available for the public or for posterity in a classified form. The Department of Agriculture and Forestry has initiated numerous investigations, but these also usually referred to a specific problem or to a certain area, so that no coherent or comparative review of agriculture as a whole could be given. The agricultural census, too, is a source of valuable information, but, unfortunately, the figures given there are in themselves of little use in demarcating and describing agricultural areas, since they are compiled according to magisterial districts which are often very extensive and may include several agricultural areas, or may sometimes fall partly under one area and partly under another. Although such figures reflect the position of agriculture according to districts, they cast no light on the underlying factors already mentioned which actually determine regional differences.

Method of Investigation.

The method of investigation employed by professional investigators is, in the first place, the ordinary survey method by which quantitative data as well as qualitative information are collected. Production figures for a sufficiently representative sample are obtained from farmers themselves by careful questioning; these data are substantiated by particulars obtained from publications, topographical, rainfall and vegetation charts, and also from statistical data on, for example, agricultural production, livestock population, rainfall, prices, etc. Interviews with local officers, farmers and other persons conversant with various local conditions, confirmed by the personal observations of investigators, have also supplied much valuable information of a non-quantitative nature.

The statistical data collected were not used for gauging the peculiarities of areas, the farming systems and the underlying factors with mathematical precision, but as a guide for (1) determin-

ing the boundaries between areas; (2) describing the areas from the agro-economic point of view, and (3) confirming observations on regional differences.

The boundary between agro-economic regions was usually drawn where the effect of one or more of the factors controlling the farming system showed a rapid rise or decline, which necessarily involved a transition in the nature of the region and in the farming system. This transition may be sudden and consequently provide an easily determinable and clearly defined boundary as, for example, in cases where plains are bordered by mountains or where a sharp division exists between soil types. In those cases, however, where a boundary is decidede by such factors as, for example, a gradual decrease in an irregular rainfall, it will be less well-defined and only approximately determinable and consequently be movable between certain limits. It should therefore be borne in mind that in circumscribing the agro-economic areas some boundaries serve only as a line of demarcation for indicating by approximation such a gradual transition between extensive areas, and that minor local changes cannot be taken into consideration. A boundary may, for example, divide a grain producing region from a livestock area, but the latter may nevertheless contain isolated cultivated patches which are, however, too insignificant to exercise an appreciable effect on the character of the region as a whole.

In determining a boundary the experience of local farmers and their exact knowledge of the locality are of the utmost assistance; this experience must be amplified, however, by the knowledge of the local extension officers, magistrates, business men and the careful observation of the investigator himself who has to confirm it continually by reference to the material (survey records, charts, etc.) at his disposal.

Value of Agro-Economic Data.

The practical value of a regional classification lies in the fact that salient regional features are emphasized and regional problems determined. A government, state departments, control boards and public institutions such as the Land Bank often find it necessary to prescribe a policy, to take a decision or to embark upon an enterprise which will be applicable to certain areas but not to others. Even individuals like farmers who, for example, desire to buy a farm in an unknown area, will find a manual in connection with the features and problems of a region of great value. Many a farmer has left his farm in search of cheaper land in a strange area and has purchased in blissful ignorance of the poisonous plants, livestock diseases and veld or soil deficiencies peculiar to that inferior area.

It will be possible to carry out future investigational work in connection with economic or other agricultural problems on the basis of the demarcated agro-economic areas at places where such problems are most urgent or important.

This investigation determines boundaries and phenomena and consequently only formulates problems. From the nature of the case it does not endeavour to offer a solution to the problem. It

constitutes, however, a valuable foundation for subsequent studies aiming at a more exhaustive investigation of the problems already determined.

Scope of Investigation.

Up till now the investigation has covered the whole of the south-eastern part of the Union which is roughly bounded by 26° E. Long. and 25° S. Lat., in addition to the wheat-growing areas and the dune or strandveld areas of the winter-rainfall region of the Western Cape Province. The region so far investigated, therefore, includes that portion of the Union which for the greater part receives a summer rainfall averaging more than 20 inches per year and consequently has a higher carrying capacity and is, on the whole, better suited to dry-land cropping. It is therefore a region in which farming can be practised more intensively. Since the natural factors according to which the agro-economic areas are really determined, are widely divergent in various parts of this region, a large number of agro-economic areas, differing considerably from one another, may be expected.

For the purpose of this investigation the agro-economic areas are grouped together according to their geographical position and their homogeneity as regards general nature and the prevailing system of farming. Hence, we obtain a simplified outline of the structure of the agricultural economy, and the comparative description is facilitated when the smaller units are again classified together into fewer and larger main regions. The groupings, as set out below, may at a later date require slight modification and improvement.

Agro-Economic Regions arranged in Groups.

1. *The inland plateau with an adequate rainfall for dry-land cropping embraces the following cropping areas*:—

   A. Transvaal highveld, B. Central Free State, C. Caledon River, D. Western Transvaal crop-production area, E. Western Free State, F. Central diversified area, and G. Hardeveld area.

2. *The irrigation areas on the northern slopes of the inland plateau*:—

   A. The irrigation area of the Western Transvaal, B. Sour highveld, and C. Eastern Transvaal.

3. *The grazing areas of the eastern mountain watershed*:—

   A. Drakensberg, B. Stormberg and C. Winterberg.

4. *Diversified farming areas east of the mountain watershed*:—

   A. Foothills, B. Temperate area of Natal, C. Natal sourveld, D. East Griqualand, E. Elliot-Maclear area and F. Transkei.

5. *The thornveld areas*:—

   A. Tugela Valley, B. Zululand and C. Higher coastal belt.

6. *The eastern coastal area* which includes:—

   A. Area east of the Lebombo range, B. Natal sugar-belt, C. Transkei coastal belt, and D. East London coastal belt.

7. *The Queenstown diversified farming area.*

8. *The Kat River irrigation area.*

9. *The winter-rainfall area of the Cape which up to the present was partly divided into:—*

   (i) *The wheat-growing areas*:—A. Swartland, B. Western Strandveld, C. Rûens, and D. Under-Langeberg.

   (ii) *The dune-veld area.*

The Inland Plateau Suited to Dry-land Production. (7 Areas.)

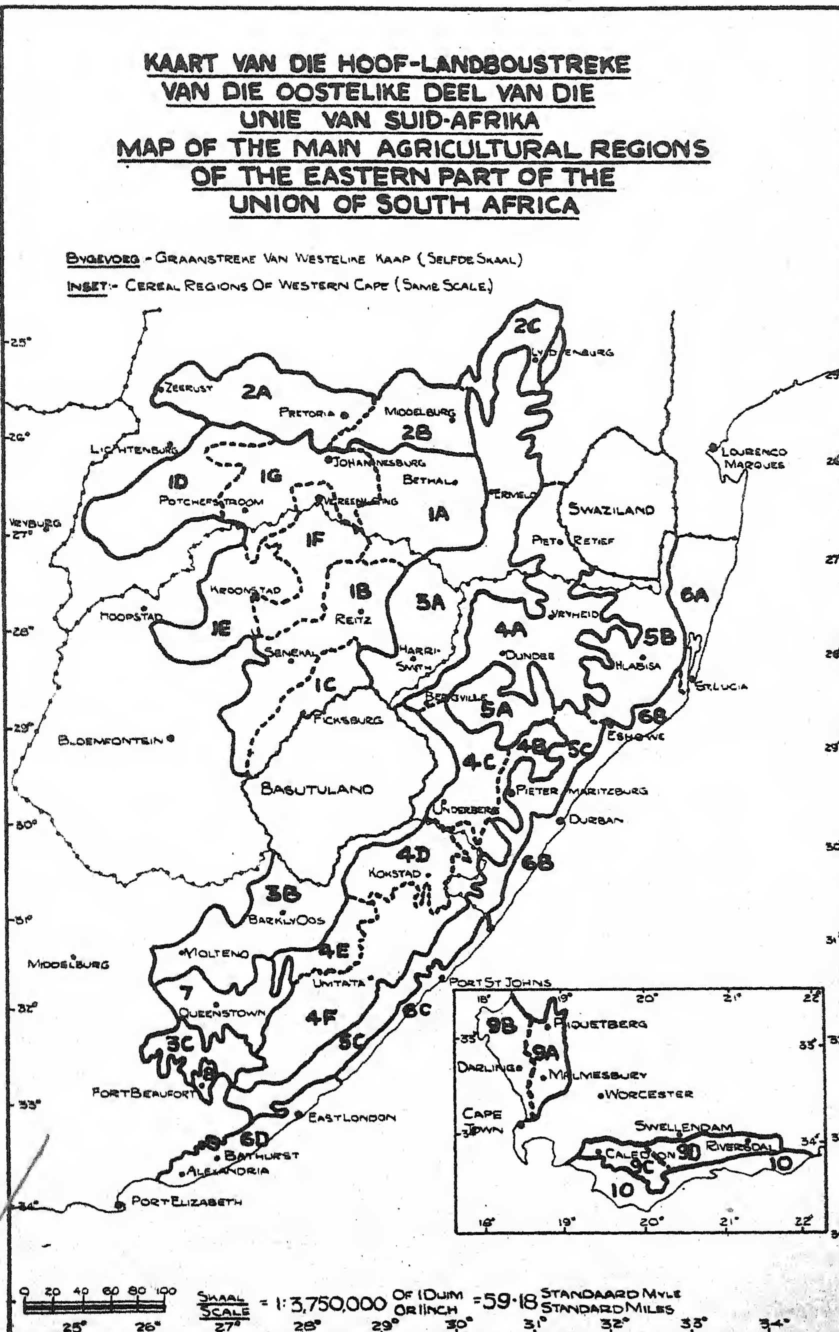
Situation and Boundaries.

This area is more or less confined to a triangle with Hendrina (Eastern Transvaal), Lichtenburg (Western Transvaal) and Hobhouse (Orange Free State) as the vertices (see map).

The northern side of the triangle divides the area from the sour highveld (2B) with its poor soils and also from the lower-lying *irrigation area of the western Transvaal* (2A). The whole of the western side forms the dividing line between the drier cattle and sheep grazing areas where, in addition to the low rainfall, the soils are either too sandy or too hard for crop production. In the north the eastern side borders on the less arable *Drakensberg grazing area* (3A) and in the south on the territorial boundary of Basutoland (which is not necessarily an agro-economic boundary).

The boundaries of the separate areas are not described here in detail since they can be traced on the map. The main differences between the areas which led to such a determination of boundaries, are described in this article.

The chief determining factor for the *highveld area* (1A) is its good arable soil, which makes a sudden transition into the very poor *sour highveld soils* (2B) and forms an easily determinable and sharply defined boundary. In the west this area borders on the *hardeveld area* (1G), which is distinguished from the rest of the plateau areas by the hilly and stony surface and consequent lack of extensive arable ground for large-scale crop production. The very precarious nature of crop production on the heavy clayey soils in the *central diversified farming area* (1F) as compared with the highveld area is due principally to the lower rainfall. The change from the highveld area to the crop-raising area of the *Central Free State* (1B) is chiefly a transition from clay-loam to sandy loam soils; Consequently, the two areas show a high degree of similarity. The *Caledon River area* (1C) is distinguished from the bordering area, the *Central Free State crop-production area* (1B) by its sandy soil and the higher rainfall, which makes wheat production safer but results in sourer grazing which is less suitable for small stock. The main feature of the crop-production areas of the *Western Free State* (1E) and the *Western Transvaal* (1D) is the sandy nature of the soil with its compact clayey sub-stratum which increases the effectiveness of the lower rainfall and so makes crop production possible. The western boundary of both areas is determined by the fact that the soil becomes too sandy and poor for extensive crop production. In the north-west, however,


KAART VAN DIE HOOF-LANDBOUSTREKE
VAN DIE OOSTELIKE DEEL VAN DIE
UNIE VAN SUID-AFRIKA
MAP OF THE MAIN AGRICULTURAL REGIONS
OF THE EASTERN PART OF THE
UNION OF SOUTH AFRICA
BYGEVOEG - GRAANSTREKE VAN WESTELIKE KAAP (SELFDE SKAAL)
INSET:- CEREAL REGIONS OF WESTERN CAPE (SAME SCALE)
ZEERUST
PRETORIA
MIDDELBURG
LICHTENBURG
JOHANNESBURG
BETHAL
POTCHEFSTROOM
VEREENIGING
ERMELO
SWAZILAND
PIET RETIEF
LOURENCO MARQUES
VRYBURG
KROONSTAD
HOOPSTAD
REITZ
HARRISMITH
VRYHEID
DUNDEE
HLABISA
ST. LUCIA
SENEKAL
BERGVILLE
FICKSBURG
ESHOWE
BLOEMFONTEIN
BASUTOLAND
PIETERMARITZBURG
UNDERBERG
DURBAN
KOKSTAD
BARKLY OOS
MIDDELBURG
MOLTENO
UMTATA
PORT ST JOHNS
QUEENSTOWN
FORT BEAUFORT
EAST LONDON
BATHURST
ALEXANDRIA
PORT ELIZABETH
PIQUETBERG
DARLING
MALMESBURY
WORCESTER
CAPE TOWN
SWELLENDAM
CALEDON
RIVERSDAL
SKAAL / SCALE = 1:3,750,000 OF 1 DUIM / OR 1 INCH = 59·18 STANDAARD MYLE / STANDARD MILES

the crop-raising area of the Western Transvaal is bordered by untillable stony veld. On the southern side both areas are bounded by harder, heavier or calcareous soils which become too arid for dry-land crop production.

Altitude and Topography.

The whole plateau on which dry-land crop production is practised, lies from 4,000 to 6,000 feet above sea-level, rising from south-west to the north and east. Topographically the plateau is generally flat in the western crop production areas and more undulating to hilly towards the east, except in the *hardeveld area* (1G) where the Witwatersrand, Gatsrand, Suikerbosrand and ridges around Parys form a broken surface. The evenness of the surface is, however, considerably interrupted by ironstone koppies on the eastern side of the *Western Transvaal crop-production area* (1D), the southern portion of the *highveld crop-production area* (1A), the *central diversified farming area* (1F), and the *Central Free State crop-production area* (1B). High sandstone koppies and mountains with arable plains between them give the *Caledon River crop-production area* (1C) its typical appearance.

Rainfall.

The whole region covered by the seven areas mentioned above, has a summer rainfall distributed mainly between October and March. The winter rainfall in the *Caledon River area* is, however, comparatively higher than in the other areas. According to the rainfall chart, the precipitation over the greater part of the *highveld*, *Caledon River* and *Central Free State crop-production areas*, as well as the *hardeveld area*, averages between 25 and 30 inches per annum. Towards the west the rainfall gradually decreases so that the average on the western boundary of the area is less than 20 inches per year. The whole plateau is subject to hailstorms.

Irrigation.

Most of the irrigation farms within this area are found in the *hardeveld area* (1G) where the majority of the spruits and rivers are fed by strong springs. In the drier parts of the other areas use is sometimes made of dams. In the flat and sandy western parts, however, fewer possibilities are offered for the construction of such dams.

Temperature.

The temperature corresponds with the altitude above sea-level, so that the most easterly areas have a longer frost period and, consequently, a shorter growth period than the western areas. Normally, frost is experienced from April-May to August-September, but it is usually the unseasonable frost which is responsible for the severest damage. Wheat and early summer crops suffer most from unseasonable late frost, while maize and other crops are often killed by early frost before reaching maturity. Day and night temperatures

vary considerably. As a result of high day temperatures during summer and the dryness of the air, the rate of evaporation is sometimes very rapid.

Soils.

The most characteristic soils of the *highveld crop-production area* (1A) range from a grey clay-loam to a heavy clay-loam which, in some parts is a dark or almost black colour. This soil is deep, fertile and saturated with lime. It requires a high rainfall, is inclined to drain poorly and to render cultivation difficult. Along the northern and north-western boundaries of this area a reddish to greyish sandy loam occurs which is cool, deep, well drained and easily cultivated. Although it soon becomes exhausted, it responds well to the application of fertilizers. In contrast to the former, the latter soil is suitable for potato production.

In the *Central Free State crop-production area* (1B), the nature of the soil varies from light clay-loam to sandy loam cropping ridges ("saaibulte") which are moderately deep and have a "pot-clay" sub-layer. In the adjoining *Caledon River crop-production area* (1C) the dominant soil type is a cooler sandy soil which is fairly deep and easily cultivated, but sourer and not very fertile.

The *central diversified farming area* (1F) has three entirely different soils in separte localities, in consequence of which farming systems differing appreciably are followed in this area. North of the Vaal River the soil is a red, fairly deep sandy loam. Along the southern bank of the Vaal River the soil is poor and sandy and further to the south a hard, generally shallow clay-loam, resting on "pot-clay" is to be found. On the latter type livestock farming predominates since dry-land crop production is an uncertain undertaking. The *Western Free State crop-production area* (1E) has a sandy loam. The soil of the eastern portion of this area has a fine and practically silty structure, becoming coarser and sandier towards the Vaal River. The *Western Transvaal crop-production area* (1D) also has a light, moderately deep sandy loam and, at certain places, a light, clay-loam. Here, too, the soil is inclined to become sandy and poorer towards the west. The explanation is that the prevailing westerly winds have blown Kalahari and Vaal River sand over the adjoining areas. The coarser sand particles were deposited first while the finer particles of dust were transported further to the east. Clay particles were washed into the soil by rainwater so that a compact, clayey sub-soil is characteristic of these soils and plays an important part in the conservation of water. Porous limestone substrata have even become impervious to water at certain places as a result of this thin layer of clay. Where the sand structure becomes too coarse (towards the west of the areas) the clay particles were washed so deep into the soil that their value as a water conserving factor has disappeared since the water drains too deeply for the root system of ordinary agricultural crops.

In the *hardeveld crop-production area* (1G) the geological formations, as well as the soils, are very variable. West and south-west of the Witwatersrand, the soil consists of almost unbroken dolomite stony veld. A shallow, gravelly soil occurs generally, and almost

everywhere is covered with unweathered stones derived from quartzite, dolomite, etc. Most of this soil is untillable, sour and poor. Along the spruits and rivers darker alluvial soils are found. These are cultivated. In the vicinity of Losberg there are plains with a sandy loam on which maize is produced.

Vegetation.

The whole region under review consists of natural grassveld. The density, composition and quality of the grasses are closely bound up with the fertility of the soils. In their virgin state the "sweet" soils of the *highveld crop-production area* (1A) and the *central diversified farming area* (1F) were covered almost exclusively with a sweet redgrass (*Themeda triandra*). On the loam and sandy loam soils of the above-mentioned areas, as well as of the *Central Free State crop-production area* (1B), more species of grasses occur, and *Themeda triandra* is supplemented chiefly by *Eragrostis* species, while on hard, stony soil varieties of "steekgras" (*Aristida*) soon make their appearance when farms are overstocked. On lands a *Panicum* species known as "soetgras" which is sometimes cut for hay, is to be found. In the *Caledon River crop-production area* (1C) the above-mentioned species are supplemented by grasses such as "taaipol" (*Eragrostis plana*) and Sporobolis, but little undisturbed veld is left. The veld is sourer, especially on the slopes of mountains and sandy ridges. In the *Western Free State* (1E) and *Western Transvaal* (1D) crop-production areas a great variety of grasses is to be found. Superficially, the veld which consists of longer and coarser grasses growing more in separate tussocks than in the above-mentioned areas, appears more rank and sour. The vegetal cover diminishes and the veld becomes sourer and poorer as the soil becomes sandier. This veld is characterised by its phosphate deficiency which results in poor bone formation and gallamsiekte in livestock. The above-mentioned grasses are supplemented by *Setarias* and *Digitarias* (finger grasses) and sour-grass families such as *Andropogon* and *Heteropogon, Cym bopogon* and *Elionurus*, whilst "kweek" *Cynodon* appears on old lands where it has its advantages as well as its disadvantages. The *hardeveld area* (1G) has the sourest and poorest veld of the plateau areas, being particularly inferior on the dolomite stony veld.

Diseases and Pests.

Stock diseases such as stywesiekte and gallamsiekte in cattle and domsiekte in sheep, which result from a mineral deficiency in the composition of grazing, appear mainly in the *hardeveld area* (1G), the *Western Transvaal* (1D) and the *Western Free State* (1E) crop-production areas, and in the sandveld portions of the *central diversified farming area* (1F) where the soil and veld are particularly deficient in phosphate.

Internal sheep parasites such as wireworm, bankrupt-worm and nodular worm are commonest in localities were the grazing is poor for sheep and where pans, vleis, etc., constitute breeding places. Consequently, the *central diversified farming area* (1F), the *highveld*

(1A) and *Central Free State* (1B) crop-production areas are the healthiest areas for sheep.

Diseases such as bluetongue and horsesickness occur in all the areas and take the heaviest toll during rainy seasons on low-lying and marshy farms. Such pests as ticks in stock and blowflies in sheep and the stalkborer in maize are present everywhere.

In so far as weeds are concerned, witchweed is a serious pest on sandy maize lands. On sandy soils kweek is the most serious weed, but has its advantages as a soil-binder against wind-erosion and as pasturage on old lands. On the richer loam and clay-loam soils of the eastern areas, water grass (uintjies), cockleburr, black-jack, Mexican marigold, stamonium and sweet grass (soetgras) are most troublesome in lands. In the eastern Orange Free State sheep sorrel is a menace in exhausted grain lands.

Utilization of Land.

The average size of farms, the area under cultivation, the value of improvements and also the value of the whole farm are reflected in TableI. The average figure for the *hardeveld* area (1G) cannot really be compared with those for the other areas owing to pronounced lack of uniformity and the fact that conditions there are affected by the proximity of the farms to the large cities. For this reason the *hardeveld area* has been divided into seven sub-areas which cannot be discussed in detail here owing to lack of space.

TABLE I.—*Comparison of farm area, extent of cultivation, value of improvements and farm—Seven Plateau crop-production areas.*

Areas.	No. of Farms.	Average Size.	Area Cultivated.	Percentage Cultivated.	Total Value of Farm.	Value of Improvements.	Improvements as per cent. of Total Value.	Farm Price per Morgen.
	No.	Morg.	Morg.	%	£	£	£	£
1A Highveld.........	317	653	197	30	4,020	824	21	6·2
1B Central Free State.	137	851	305	36	6,747	1,133	17	7·9
1C Caledon River.....	93	726	293	40	5,968	1,302	22	8·2
1D Western Transvaal.	149	779	203	26	3,083	775	25	4·0
1E Western Free State	114	779	290	37	5,082	923	18	6·5
1F Central Diversified.	106	782	184	24	4,496	847	19	5·7
1G Hardeveld........	214	565	73	13	3,462	848	25	6·1

Of the remaining areas the *highveld crop-production area* (1A) has the smallest average size of farm, namely, 653 morgen. This is largely due to the fact that there are a considerable number of small settlement farms in this area. The *Central Free State crop-production area* (1B) has the largest average size of farm (851 morgen),

while for the four remaining areas the average lies between 700 and 800 morgen.

The *Central Free State* has the largest area per farm under cultivation (305 morgen), but in the *Caledon River crop-production area* (1C) the largest percentage of the farm area is cultivated, namely 40 per cent. As is to be expected, the *hardeveld area* (1G) has only 13 per cent. of the farm area under cultivation and the *central diversified farming area* (1F) 24 per cent., while of those areas where maize production is practically the only enterprise, *Western Transvaal* (1D) has the lowest figure, namely 26 per cent.

In the central portion of the *highveld area* (1A) a large part of the farms is cultivated. It is more towards the south-west which is inclined to be hard and hilly where most of the farms consist largely of grazing veld. In the *Western Free State crop-production area* (1E) most land has been brought under cultivation in the eastern part. In this area, as in the *Western Transvaal* (1D), the intensity of crop production gradually decreases towards the west and south as the soil becomes poorer and the rainfall lower.

A general phenomenon is the fact that the smaller farms have a greater percentage of their surface under cultivation than the larger farms.

Dry-land farming is the rule, irrigation playing an important rôle only in certain portions of the *hardeveld area* (1G). Where sandy soil appears, the lands which are easily exhausted, are often abandoned for years and used for grazing only. Such soil regains some of its fertility and can subsequently be cultivated again. Uncultivated portions of the farm are used as natural grazing. Little is being done in the whole area by way of grazing improvement or the establishment of pastures.

Value of Soil and Improvements.

According to Table I the average land prices are highest for the *Caledon River crop-production area* (1C), namely £8·2 per morgen, whereas the *Western Transvaal crop-production area* (1D) has the lowest average figure for the areas concerned, namely £4·0 per morgen. In comparison with other areas, the land prices in the *highveld crop-production area* (1A) are valued on the low side, probably because of the fact that this area has numerous small settlement farms. Within each area, however, there are widely differing land prices which apart from the value of improvements, are determined mainly by the percentage of arable soil on a farm and its production capacity.

The average size of the farms is greatest in the *Central Free State crop-production area* (1B), and for this area both the total farm value and the value of improvements alone are the highest for all areas; the value of the improvements expressed as a percentage of the total farm value, however, amounts to only 17 per cent. which is the lowest for all areas. In sharp contrast to this is the *Western Transvaal crop-production area* (1D), where, of all the areas concerned, the averages are lowest for the total farm value and the value of improvements but where the ratio of improvement value to total farm value is the highest of all, namely, 25 per cent.

This phenomenon is also observed in cases where the farms in an area are classified according to size groups. On the smaller farms the ratio of improvement value to total value is, as a rule, higher than in the case of the large farms. This may be explained by the fact that a certain minimum of improvements such as farm-house, sheds, water provision and fencing is necessary on every farm. On larger farms the extent and quality of improvements are usually greater but not in direct proportion to the increase in area.

Crops.

Since this region receives most of its rain during the summer months and severe frost impedes growth in winter, summer crops receive most attention, although wheat in the Eastern Free State and oats, more generally, are sown before the winter. Within the boundaries of the Union of South Africa this area ranks first for summer crops. Compared with other crop-production areas of the world, however, the area under discussion is not exceptionally productive. The main reasons for this are irregular rainfall, coupled with a deficiency in phosphate and humus in the soil. Fertilizer and, to a lesser extent, kraal manure are used for supplementing this deficiency. Green manuring is seldom, if ever, resorted to, and it remains a moot point whether this practice is economically profitable. Even where rotational cropping is practised to any extent, it is seldom done judiciously.

Particulars of fertilizer and kraal manure applications are given in Table II.

TABLE II.—*Utilization of Fertilizer and kraal manure in Seven plateau areas.*

Areas.	Fertilizer.		Kraal Manure.	
	Tons per Farm.	Lb. per Cultivated Morgen.	Tons per Farm.	Lb. per Cultivated Morgen.
1A. Highveld	18·1	183	16·2	164
1B. Central Orange Free State	5·7	38	7·8	52
1C. Caledon River	11·8	80	29·8	203
1D. Western Transvaal	10·1	100	11·0	108
1E. Western Free State	9·7	67	0	0
1F. Central Diversified	2·6	28	15·3	166
1G. Hardeveld	2·6	62	25·3	610

The fertilizer application is highest for the *highveld area* (1A), averaging 183 lb. per morgen. This is mainly due to the fact that potato production is engaged in on the sandy loam soils. If this type of farming is left out of account, the fertilizer consumption averages only 91 lb. per cultivated morgen for the remainder of the area. On the sandy soils of *Western Transvaal* (1D) and *Western*

TABLE III.—*Area under crops; average per farm in Seven plateau areas.*

	A. High veld.	B. Central O.F.S.	C. Caledon River.	D. Western Transvaal.	E. Western O.F.S.	F. Central Diversified.	G. Hardeveld.
Maize	144	187	104	175	264	155	57
Wheat	1	63	148	1	0	1	3
Oats	11	25	14	3	0	7	0
Teff	27	15	8	3	10	14	5
Kaffircorn	0	0	0	14	2	3	2
Potatoes	7	2	2	0	0	0	0
Beans	3	3	0	2	0	0	0
Other fodder crops	2	9	14	4	14	4	5
Other	2	1	3	1	0	0	1
TOTAL	197	305	293	203	290	184	73
Total average farm size	653	851	726	779	779	782	565
Each expressed as a percentage of total.							
Maize	73·1	61·3	35·5	86·2	91·0	84·2	78·1
Wheat	0·5	20·6	50·5	0·5	0·0	0·6	4·1
Oats	5·6	8·2	4·8	1·5	0·0	3·8	0·0
Teff	13·7	4·9	2·7	1·5	3·4	7·6	6·9
Kaffircorn	0·0	0·0	0·0	6·9	·7	1·6	2·7
Potatoes	3·6	0·7	0·7	0·0	0·0	0·0	0·0
Beans	1·5	1·0	0·0	1·0	0·0	0·0	0·0
Other fodder crops	1·0	3·0	4·8	1·9	4·9	2·2	6·8
Other	1·0	0·3	1·0	0·5	0·0	0·0	1·4
TOTAL	100	100	100	100	100	100	100
Percentage under crops	30·2	35·8	40·4	26·1	37·2	23·5	12·9

Free State (1E) the fertilizer application per morgen under cultivation amounts to 100 lb. and 67 lb., respectively. In the *Caledon River area* (1C) where a considerable amount of wheat is produced, an average of 80 lb. fertilizer and 203 lb. kraal manure is applied per morgen under cultivation. The kraal manure application in this area is comparatively high since dairying is practised here so that a considerable quantity of manure is produced, whereas in the

Western Free State (1E) where few sheep are kept and cattle seldom kraaled, hardly any animal manure is applied. In the case of the *hardeveld area* (1D) it is mainly the presence of dairies and the fact that vegetables, etc., are produced on a small scale under irrigation, which account for the intensive manuring.

Maize and wheat.—From Table III it is evident that maize plays an important rôle throughout this region; the *Caledon River area* (1C) is the only one in which maize is not the most important crop, but in which wheat covers the largest area. The most one-sided maize-producing areas are: the *Western Free State* (1E) and *Western Transvaal* (1D) where, respectively, no less than 91 per cent. and 86 per cent. of the area cultivated are under maize. In the *Central Free State* (1B) which borders on the *Caledon River area* the average number of morgen per farm under wheat is 63, whereas the acreage under wheat in the adjoining areas is insignificant in comparison.

Oats.—In the eastern portion of this region oats are sown mainly as winter feed, but towards the west the crop is cultivated on a smaller scale. In the sandy soils of the *Western Free State* (1E) hardly any winter crops are cultivated and in the *Western Transvaal* (1D) the quantity is very small.

Teff.—In the *highveld area* (1A) an average of 27 morgen (or 13 per cent.) is sown to teff, the morgenage expressed as a percentage being smallest in the sandy soils of the Caledon River, Western Transvaal and Western Free State areas. One reason for this may be that successful germination of teff seed is more difficult in sandy soils.

Kaffircorn.—Kaffircorn, which is more resistant to drought than maize, is used partly to replace maize, especially in those areas where the rainfall is very erratic or the soil is very dry. Most kaffircorn is sown in the *Western Transvaal* (1D) while it is not cultivated in the eastern areas at all.

Potatoes are grown extensively in the region under review mainly in two localities, namely, on sandy loam soil in an area situated more or less between Delmas and Bethal in the *highveld area*(1A), and between Tweespruit and Marseilles in the *Central Free State* (1B) and *Caledon River* (1C) areas. In addition, potatoes are cultivated, although on a much smaller scale, in the Marquard area in the *Orange Free State* and around Coligny in the *Western Transvaal*.

Beans are grown on a small scale in the crop production areas of the *highveld* (1A) and the *Central Free State* (1B), and also in the *Western Transvaal* (1D) in the vicinity of Koster.

Cowpeas.—In so far as other fodder crops are concerned, a considerable quantity of *cowpeas* is produced in the *Western Free State* (1E) and, to a lesser extent, in the *Western Transvaal* (1D) and *Caledon River* (1C) areas. The value of cowpeas, not only as animal fodder but also as a means of fixing and increasing nitrogen in the soil, is only beginning to be realized by farmers. Since the crop is also resistant to drought, a large expansion of its cultivation may still be expected, especially if the erect-growing varieties which can be mown by machine, prove to be a success and become established.

Rye.—As winter grazing, rye is cultivated practically only in the *Caledon River* (1C) and *Central Free State* (1B) areas and, as in the case of oats and wheat, a second crop is harvested and threshed during a good year.

Other crops.—Throughout this region very little millet is grown while lucerne is cultivated mainly under irrigation in the *hardeveld area* (1G) where it serves to a large extent as a cash crop. In the *hardeveld area* (1G) vegetables are produced on a fairly large scale for the Witwatersrand market, whereas they are grown mainly for domestic use in the other crop production areas. In the hilly country between Parys and Potchefstroom in the *hardeveld area* (1G) tobacco is grown. On most farms fruit is grown for domestic use, except in the *hardeveld area* (1G) where it is also produced for the Witwatersrand market. In the *Caledon River* area (1C) commercial apple, cherry and peach plantations are to be found. Fruit production on the inland plateau is severly hampered, however, by hailstorms and unseasonable frost.

Yield and Consumption of Maize, Wheat and Other Cash Crops.

As indicated in Table 4, the highest yields of maize per morgen are obtained in the *highveld crop-production area* (1A) which ranks first with an average yield of 10·6 bags per morgen, whereas the other four crop-production areas yield about 7 bags per morgen and the *central diversified farming area* (1F) and the *hardeveld area* (1G) only about 5½ bags per morgen.

The largest average maize crop per farm, namely, 2,004 bags, is obtained in the *Western Free State crop-production area* (1E), this being due to the large percentage of land under cultivation, whereas the *highveld crop-production area* (1A) ranks second in importance with a crop of 1,525 bags per farm notwithstanding its high yield per morgen. In the *Caledon River area* (1C) the maize crop per farm is only 756 bags since most of the land is sown to wheat. In the *hardeveld area* (1G) the quantity of maize planted is not only low, but the yields are also small, so that the area cannot really be called a crop-production area.

In all these areas the greater part of the maize crop is sold, the percentage being highest in the crop-production areas of the *Western Transvaal* (1D) and *Western Free State* (1E). In these areas 87 per cent. and 88 per cent., respectively, of the maize crops are sold, only 7 per cent. being used for feed. In the *Caledon River area* (1C) the largest proportion of the maize crop is utilized as feed, namely, an average of 202 bags or 27 per cent. of the total crop, which is probably due to the dairy enterprise. Moreover, maize stalks and also maize silage play an important rôle as stock feed on farms.

If the two areas in which wheat is grown on a somewhat extensive scale are considered, we find that the average size of the crop in the *Caledon River area* (1C) is 738 bags per 148 morgen under wheat, representing a yield of 5 bags per morgen, whereas in the *Central Free State area* (1B) 234 bags are obtained per 63 morgen under wheat, which is equivalent to only 4 bags per morgen. The average wheat yield, even when calculated over a number of

years, is therefore extremely poor so that it is mainly the high prices realized for wheat (as compared with those for maize) which stimulated wheat production in this area. Wheat lands, however, have the additional advantage that during poor years they may be used either wholly or partly as green winter pasturage. During favourable seasons they serve a double purpose in that they may first be grazed and, if a second growth proves possible, may subsequently be harvested.

Most of the potato-crop is produced in the *highveld crop-production area* (1A). On farms where less than 50 morgen are planted, the average area under this crop is 7·6 morgen and the average yield 84 bags per morgen. Farms with more than 50 morgen planted to potatoes are confined almost exclusively to the production of this crop, so that the average area under potatoes is 192 morgen. Here large-scale potato farmers apply fertilizer very liberally and obtain an average of 144 bags per morgen. About 80 per cent. of the potato-crop is sold; of the remainder a certain percentage is retained for seed, and the inferior tubers used as feed, especially for pigs.

TABLE IV.—*Yield and Consumption of maize in Seven areas of the inland plateau.*

Areas.	Area Planted per Farm.	Yield per Farm.	Yield per Morgen.	Sold.	Domestic Consumption and Seed.	Used as Feed.
	Morgen.	Bags.	Bags.	Bags.	Bags.	Bags.
1A. Highveld..................	144	1,525	10·6	1,265	118	142
1B. Central Free State.........	187	1,238	6·6	980	100	158
1C. Caledon River.............	104	756	7·3	461	93	202
1D. Western Transvaal.........	175	1,284	7·3	1,123	76	85
1E. Western Free State........	264	2,004	7·8	1,772	90	142
1F. Central Diversified........	155	814	5·5	610	69	135
1G. Hardeveld...............	57	317	5·6	223	43	51
Percentage of Total Yield.						
1A. Highveld..................	—	100	—	83	8	9
1B. Central Free State.........	—	100	—	78	8	14
1C. Caledon River.............	—	100	—	61	12	27
1D. Western Transvaal.........	—	100	—	87	6	7
1E. Western Free State........	—	100	—	88	5	7
1F. Central Diversified........	—	100	—	75	8	17
1G. Hardeveld...............	—	100	—	70	14	16

Livestock Farming.

The inland plateau with its healthy climate and comparatively dense grass cover is eminently suited to stock. In addition to crop

production, the *highveld farms* (1A) carry an average of 34 head of large-stock units per 100 morgen and the *Central Free State crop-production area* (1B) 33 head of large-stock units. These two areas show the highest average carrying capacity, whereas the *hardeveld area* (1G) with its inferior sour veld comes last with 22 head of large-stock units. Next rank the *two western dry sandveld areas of the Transvaal and Free State* (1D and 1E). Although horses, mules, donkeys, pigs, and poultry are kept everywhere, cattle and sheep occupy by far the most important position in the farming system. The ratio of sheep to cattle in the farming system depends to a large extent on the nature of the veld and the intensity of cultivation. On the smaller farms where, as a rule, a greater percentage of the ground is ploughed, the grazing is utilized mainly for the draught oxen and a few milch cows, where the small stock may at best consist of the necessary slaughter animals.

The Central Free State crop-production area (1B) and the *central diversified farming area* (1F) have the most sheep in relation to cattle, namely, 3·5 and 3·3 sheep per head of cattle, respectively. This is probably ascribable to the sweet veld and comparatively extensive grazing available. In the *highveld crop-production area* (1A) sweet veld also occurs, but the farms are already fairly small; consequently, the average number of sheep per head of cattle is only 2·7. In the *Caledon River crop-production area* (1C) sheep farming is not such a flourishing undertaking since the veld is hard and sour and the rainfall high, so that most attention is devoted to dairy farming. Consequently the ratio of sheep to cattle in this area is only 2:1. In the *Western Free State* (1E) and *Western Transvaal* (1D) *crop-production areas* the long, hard grasses are not very suitable for sheep. In the *hardeveld* (1G), which has by far the sourest veld of all the areas under discussion, conditions are very unfavourable for sheep farming and the ratio between sheep and cattle is only 1·4 per head of cattle.

Cattle.—The cattle in the crop-production areas consist to a large extent of trek oxen, especially on the smaller farms. In most areas, however, cows are usually kept for breeding purposes as well as dairying, but generally have to depend on the seasonal grazing only. Dairy farming is practised generally in the *Caledon River area* (1C) where there are a number of cheese factories. Around the Witwatersrand and on the farms along the railway lines radiating from this point through the Transvaal and Orange Free State, fresh milk is produced. Fresh-milk production always yields a high gross income and for this reason the average income per owner's head of cattle, namely £3·4, is highest in the *hardeveld area* (1G) which supplies large quantities of drinking milk to the Witwatersrand. (See Table V). Many of the dairy farms are situated around the Witwatersrand urban area and have to buy a large percentage of their feed. In the *central diversified farming area* (1F) fresh milk is also produced on the farms along the railway and around Vereeniging for Vereeniging and the Witwatersrand area. The average gross income in this case is £1·5 per head of cattle (all cattle included). On many farms in the *highveld area* the cattle consist practically of trek oxen only; consequently, the average income

here is only £0·9 per head. Rapid expansion of dairy farming for providing the Witwatersrand market with fresh milk is taking place, however, along the railways and at Standerton a condensery, which is also stimulating production in that area, has been erected.

In the *Western Transvaal* (1D) and *Western Free State* (1E) crop-production areas, cattle farming is on the whole, still practised extensively, with the result that the income is also low, namely £0·9 and £0·8 per head of cattle respectively.

TABLE V.—*Comparison of the number of live-stock, income per unit and carrying capacity for Seven plateau areas.*

	A. High-veld.	B. Central Free State.	C. Caledon River.	D. Western Trans-vaal.	E. Western Free State.	F. Central Diver-sified.	G. Harde-veld.
Cattle	149	177	160	117	132	141	97
Income per head of owner's cattle	£0·9	£1·3	£2·1	£0·9	£0·8	£1·5	£3·4
Sheep	407	616	321	245	380	467	135
Income per head of owner's sheep	£0·31	£0·34	£0·31	£0·19	£0·30	£0·29	£0·23
Horses, mules and donkeys	10	16	10	22	15	13	7
Pigs	8	7	7	5	8	4	3
Poultry	130	138	84	110	151	128	134
Carrying capacity, l.s.u. per 100 morgen*	34	33	30	23	26	29	22
Number of sheep per head of cattle	2·7	3·5	2·0	2·1	2·9	3·3	1·4

* l.s.u.: i.e. large-stock units: 1 horse or head of cattle = 7 sheep = 4 pigs = 100 head of poultry.

Sheep.—As indicated above, most sheep are found in the sweet-veld areas. For this reason the *Central Free State* (1B), *central diversified farming* (1F) and *highveld* (1A) areas have most sheep per farm. In the *Western Transvaal* (1D) and *hardeveld* (1G) areas, the number of sheep kept is not only small but the income derived per sheep is also considerably less. This fact can be ascribed to two causes. First, fewer woolled sheep are kept and, secondly, the natural increase in a poor sheep area is so small that few can be sold, even if non-woolled sheep are kept. For the other areas the average income was 5s. 10d. to 6s. 10d. per sheep. The weight of wool shorn per sheep was lowest in the *Western Transvaal crop-production area* (6·6 lb. per sheep), and highest in the *Caledon River* and *Central Free State crop-production areas*, namely, 7·9 and 7·8 lb. respectively.

The average price received by the farmer for wool, which is indicative of the quality, was 6·6d. per lb. for the *Western Transvaal crop-production area*, this also being the lowest for all areas in the region. The sheep kept in this area are not of a very good type, and the wool is inclined to be burry and sandy. Furthermore, it should be borne in mind that farmers in this area shear at six or nine months and therefore sell short wool. In the *Western Free State* (1E) and

hardeveld (1D) areas the average wool price is just below 8d. per lb., but in the other crop-production areas it ranges from 8d. to 9d.

The lambing ewes in the various areas average between 41 per cent. and 50 per cent. of the flock. Of these an average of between 72 per cent. and 79 per cent. lamb, whereas the percentage of lambs reared out of the total number born, varies from 75 per cent. to 83 per cent.

During the winter the veld of this region is killed by frost. Consequently, it is hard and lacking in nutritive value, especially on poor soil where sour veld is found. Maize stalks and weeds such as Cape gooseberries on reaped lands, supplemented by hay feed and green winter pastures of oats or wheat, help to tide the sheep over the winter. The green feed is intended specially for ewes with lamb at foot during dry years, and when this is not available, the lamb crop suffers badly.

Other Livestock.—The inland plateau is healthy for horses, and it is only during wet years that severe outbreaks of horsesickness occur. Horse and mule breeding, however, has been sadly neglected so that on most farms to-day only the draught horses and perhaps a few breeding mares are to be found. Donkeys are used as draught animals in localities where the veld is poor as, for example, in the *Western Transvaal* (1D) and *Western Free State* (1E) and on the poorer land of the *hardeveld area* (1G).

Pigs are usually kept on a small scale on most farms but have generally to exist on waste products alone. Except in towns or in the vicinity of railway stations, poultry is seldom kept on a large scale.

Sources of Cash Income.

A comparison of the average farm income for the Seven plateau crop-production areas is given in Table VI.

The *Caledon River area* (1C) shows the highest average gross cash income, namely £1,363·2 per farm. Next comes the *Central Free State area* (1B) with £1,108·7 and the *highveld area* (1A) with £1,069·9 per farm. The *Western Free State area* shows a gross income of £951·6 per farm, which is considerably higher than in the case of the *Western Transvaal area* (1D), where the average is £636·6 per farm. In the *central diversified farming area* (1F) the income derived from crops is considerably lower than in those areas where crop production is the main enterprise, so that the total income amounts to only £599·0. The *hardeveld area* (1G) shows a relatively high income from cattle, which is due to the fact that dairy farming is carried on in the vicinity of large urban centres. This fact helps to raise the average gross income of this comparatively poor agricultural area to £534·8.

The *Caledon River area* (1C) shows the highest income from crops which is attributable more particularly to the income from wheat, which amounts to £668·4 per farm (49 per cent.). The income from maize accounts for 13·5 per cent. and that from potatoes for 4·1 per cent. of the total income. In all other areas maize is the chief source of crop income. In the *Western Transvaal* (1D) and the *Western Free State* (1E) areas, the percentage income from crops is highest (76·0 per cent. and 74·4 per cent. respectively), this income being obtained almost exclusively for maize. In the *Central Free State* (1B) wheat and in the *highveld area* (1A) potatoes rank next to maize for the most important contributions to the income from crop production.

TABLE VI.—*Sources of cash income. Average per farm for seven plateau areas.*

	A. High-veld.	B. Central Free State.	C. Caledon River.	D. West Trans-vaal.	E. West Free State.	F. Central Diver-sified.	G. Harde-veld.
	£	£	£	£	£	£	£
Crops—							
Maize	505·9	293·6	184·3	449·2	703·8	243·9	89·0
Wheat	3·5	201·4	668·4	5·3	1·0	1·0	18·6
Oats	0·1	6·3	8·6	—	—	—	—
Teff	11·4	1·0	—	0·2	—	0·1	—
Kaffircorn	—	—	—	33·3	7·1	10·1	3·6
Potatoes	248·6	53·4	56·3	5·6	—	1·8	12·1
Vegetables	2·2	0·8	3·7	—	—	—	17·9
Beans	12·6	0·5	1·9	9·5	—	—	—
Other	1·6	1·4	0·5	1·1	0·5	0·5	54·4
TOTAL CROPS	785·9	658·5	923·6	504·2	712·4	257·4	195·6
Livestock—							
Cattle	117·6	197·9	299·0	94·6	97·6	180·6	287·9
Sheep	122·9	206·2	96·5	46·7	111·4	135·3	30·5
Horses	1·9	6·5	2·7	1·1	2·6	0·2	·1
Pigs	16·0	17·0	31·7	7·5	8·8	5·7	·8
Poultry	25·6	22·6	9·7	9·6	24·8	19·9	19·9
TOTAL LIVESTOCK	284·0	450·2	439·6	159·6	245·2	341·6	339·2
TOTAL, ALL SOURCES	1,069·9	1,108·7	1,363·2	663·6	951·6	599·0	534·8
Farm Size (Morgen)	653	851	726	779	779	782	565
Income per Morgen	£1·2	£1·3	£1·9	£0·9	£1·2	£0·8	£0·9
Percentage Income from Each Source.							
Crops—							
Maize	47·3	35·5	13·5	67·8	73·5	40·7	16·6
Wheat	0·3	18·2	49·0	0·8	0·1	0·2	3·5
Oats	0·0	0·6	0·6	—	—	—	—
Teff	1·1	0·1	—	0·0	—	0·0	—
Kaffircorn	—	—	—	5·0	0·7	1·7	·7
Potatoes	23·3	4·8	4·1	0·8	—	0·3	2·31
Vegetables	0·2	0·1	0·3	—	—	—	3·3
Beans	1·2	0·0	0·2	1·4	—	—	—
Other	0·0	0·1	0·1	0·2	0·1	0·1	10·2
TOTAL CROPS	73·4	59·4	67·8	76·0	74·7	73·0	36·6
Livestock—							
Cattle	11·0	17·8	21·9	14·2	10·2	30·1	53·8
Sheep	11·5	18·6	7·1	7·0	11·6	22·6	5·7
Horses	0·1	0·7	0·2	0·2	0·3	0·0	·0
Pigs	1·6	1·5	2·3	1·1	0·9	1·0	·2
Poultry	2·4	2·0	0·7	1·5	2·6	3·3	3·7
TOTAL LIVESTOCK	26·6	40·6	32·2	24·0	25·6	57·0	63·4
TOTAL, ALL SOURCES	100·0	100·0	100·0	100·0	100·0	100·0	100·0

TABLE VII.—*Indebtedness on farms in seven plateau crop-production areas.*

	IA. High-veld.	IB. Central Free State.	IC. Caledon River.	ID. Western Trans-vaal.	IE. Western Free State.	IF. Diver-sified, Central	IG. Harde-veld.
Number of farms.....	263	122	83	136	103	92	190
Indebtedness :—							
(i) Land.........	841·8	1,420·7	1,182·9	711·9	874·8	928·1	598·6
(ii) Improvements..	1·5	0·6	2·5	4·0	0·15	3·7	2·6
(iii) Livestock......	9·0	15·6	4·2	27·6	6·8	7·8	17·3
Total.............	852·3	1,436·8	1,189·6	743·6	882·1	939·6	618·5
Farm Area (morgen)..	657·6	851·1	736·6	750·7	725·5	800·0	541·1
Debt per 100 morgen..	129·6	168·8	161·5	99·0	121·6	117·4	114·3
Debt per £100 fixed Capital	21·1	21·3	19·4	24·4	18·4	19·9	17·5
Income per £100 Fixed Capital	21·8	16·4	24·2	21·2	18·4	13·1	15·7

Only in the *hardeveld* (1G) and *central diversified farming* (1F) areas is the income from livestock higher than that obtained from crop production. In every area the income from cattle and sheep is higher than that of all the other branches of stock farming. In the milk-producing *hardeveld* (1G) and *Caledon River* (1C) areas, and, to a lesser extent, in the *central diversified farming area* (1F) cattle account for a higher income than sheep. Although the *Western Transvaal* (1D) shows the lowest income from cattle, the income from sheep is only about half that figure, since the area is not well suited to sheep.

The intensity of the farming operations may roughly be gauged by expressing the gross income in terms of a unit of acreage. In Table VI the gross farm income of every area per morgen of farm area is reflected. The highest income, namely, £1·9 per morgen, is obtained in the *Caledon River area* (1C) followed by £1·3, £1·2 and £1·2 per morgen in the *Central Free State* (1B), *highveld* (1A) and *Western Free State* (1E), respectively. The *Western Transvaal* (1D), *central diversified farming* (1F) and the *hardeveld* (1G) areas show a gross income of £0·9, £0·8 and £0·9, respectively. As indicated above, it is mainly milk, vegetable and fruit production for the Witwatersrand market which is responsible for the favourable comparison in the last-mentioned area.

Indebtedness.—Particulars and a comparison of the indebtedness are given in Table VII.

Only such farms as were occupied by the owner and in respect of which information regarding the indebtedness was readily given, are included in the above table. The largest average indebtedness, even when calculated on a basis of 100 morgen of farm area, is found in the *Central Free State* (1B). Since the value of the land varies considerably from area to area, the indebtedness per £100 of fixed capital (i.e. land and improvements) provides a better basis of comparison. The largest indebtedness per £100 of fixed capital, namely, £24·4, is found in the *Western Transvaal* (1D); if the *hardeveld* (1G) is excluded, the indebtedness is smallest in the *Western Free State* (1E) where it amounts to £18·4. A comparison of debt in terms of fixed capital, however, does not indicate in which area the indebtedness is greatest, unless the income is also taken into consideration. A comparison of the gross incomes per £100 of fixed capital will show the income to be the highest in the *Caledon River area* (1C), namely, £24·7, as against an indebtedness of £19·4 per £100 of fixed capital. In the *hardeveld* (1G), *central diversified farming* (1F), *Western Transvaal* (1D) and *Central Free State* (1B) areas, the total indebtedness, however, exceeds the annual gross income as will be seen from Table VII where both are given on a basis of £100 of fixed capital.

N.B.—The remaining areas will be dealt with in subsequent issues.

Crops and Markets

A Statistical and Economic Review of South African Agriculture

by

The Division of Economics and Markets

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CONTENTS

Price Review for February, 1942.*

SLAUGHTER STOCK.—The seasonal decline in *cattle prices*, which set in during January, continued throughout February. Prices of ordinary primes on the *Johannesburg market* declined from 59s. 6d. per 100 lb. estimated dressed weight *on the hoof* in January to 53s. 4d. in February; good mediums declined from 54s. 1d. to 40s. 6d. Prices of medium cattle on the *Durban market* declined from 45s. 1d. per 100 lb. dressed weight *on the hook* in January to 38s. 11d. in February, and compounds from 29s. 3d. to 26s. 7d.

Prices of *baconers* rose from 7·0d per lb. live weight to 8d. per lb. on the *Johannesburg market*. The prices of porkers remained practically unchanged.

Smaller supplies of sheep, especially of primes and good mediums, caused prices to increase on all markets. On the *Johannesburg market* prices of prime merino wethers rose from 8·7d. per lb. estimated dressed weight in January to 9·3d. in February, and those of medium merino wethers from 7·8d. to 8·3d.; prices of prime persians and cross-breds increased from 7·5d. to 8·2d. and those of mediums from 6·7d. to 7·7d. On the *Cape Town market* the corresponding increases in prices were: prime merinos from 7·4d. to 9·0d.; medium merinos from 7·1d. to 8·3d.; prime persians and cross-breds from 7·4d. to 8·7d., and mediums from 7·2d. to 8·3d. per lb.

Mealies.—According to the recent regulations adopted by the Mealie Control Board, and published elsewhere in this issue, only the Board will buy mealies from producers from now on until April 1942. Prices have been fixed at 10s. 6d. per 200 lb. in bags, and

* All prices are average prices.

9s. 5d. per 200 lb. in elevator, f.o.r. for grades 2 and 6. Correspondingly lower prices will be paid for lower grades.

Kaffircorn.—Supplies are extremely limited as it is practically the end of the season. Consequently prices showed further increases, from 21s. 5d. and 22s. 3d. per bag f.o.r. for K1 and K2 in January to 21s. 11d. and 22s. 11d. respectively in February.

Feeds.—On the *Johannesburg market* supplies of lucerne hay were relatively large but of poor quality. However, the demand was strong and prices remained practically unchanged. Supplies of teff were light, but owing to the poor quality prices declined somewhat, viz., from 4s. 11d. per 100 lb. in January to 4s. 4d. in February. On the whole, feeds of all kinds were relatively scarce on all markets. Feed merchants everywhere state that their supplies of feed are becoming very small. For some kinds of feeds, such as oil-cake meal, fishmeal and meatmeal, separate prices are no longer quoted as the feed merchants use them in mixtures only.

Potatoes.—The Johannesburg and Pretoria markets were well supplied with potatoes from the highveld where the main crop is now becoming available. The quality was unsatisfactory and prices declined except for good qualities for which the demand remained steady and prices rose somewhat. On the Johannesburg market Transvaal No. 1 declined from 18s. 8d. per bag in January to 15s. 9d. in February, and Transvaal No. 2 from 16s. 4d. to 13s. 11d. On the other hand, prices of National Mark Grade 1 increased from 20s. 6d. to 20s. 11d., and from 18s. 11d. to 20s. 5d., for Nos. 2 and 3 respectively. On the other markets Cape potatoes still predominated and supplied the needs which, in other years, were met by Transvaal and O.F.S. consignments. However, the quality and keeping quality of the Cape summer potatoes are poor, necessitating quick marketing, with the result that prices showed a slight decline everywhere except in Cape Town itself, where an exceptionally strong demand as well as the activity of buyers from other centres caused prices to rise, viz., from 15s. 3d. per bag in January to 16s. 3d. in February, for Cape No. 1. Since the middle of the month supplies of Cape potatoes began to decline everywhere.

Onions.—Although supplies were somewhat lighter than during the previous month, all markets were still well supplied with onions, especially Cape onions. Prices declined somewhat, e.g., Cape onions on the *Johannesburg market* declined from 10s. 2d. to 9s. 9d. per bag in February, and on the *Cape Town market* from 7s. 10d. to 7s.

Vegetables.—On the whole, most markets were better supplied with vegetables during February than during the previous month. Good prices were maintained and price declines were limited to cases where the quality of the vegetables was poor, or where the market was temporarily overloaded by irregular consignments.

Deciduous fruit.—Supplies of apples, pears, and grapes increased, and moderate quantities of plums were offered, but supplies of peaches declined considerably. Good-quality fruit fetched excellent prices everywhere. It seems, however, that at times two main factors affected the marketing of deciduous fruit adversely, viz. (*a*) irregular consignments which caused considerable price

fluctuations and (*b*) over-ripe condition of some consignments, especially of plums.

Tropical fruit.—Large quantities of pineapples from the eastern Cape Province were offered on most markets. Prices, however, remained at a high level. Other tropical fruits were scarce, especially bananas, as a result of the drought in Natal. Avocado pears, for which the season has started, are increasing in quantity..

Eggs.—Almost everywhere supplies of eggs were lighter than during the preceding month, and prices either rose or remained unchanged. On the *Johannesburg market* prices of new-laid eggs increased from 1s. 7d. per doz. in January to 1s. 9d. in February, and on the *Durban market* they remained unchanged at 2s. per doz.

Index of prices of agricultural and pastoral products.—The indices of prices of all groups of agricultural products remained practically unchanged during February, as compared with those for January. The group "other agricultural products," consisting of potatoes, sweet potatoes, onions and dry beans, is the only one which changed considerably, declining from 180 in January to 168 in February. This decline was due largely to the decline in the prices of potatoes and onions. The index of prices of dairy products increased by 8 points, viz. from 122 to 130. This was due to the increase of 1d. in the price paid to producers per lb. of butterfat, and per gallon of cheese milk which became effective from 1 February. The price index for slaughter stock declined from 144 in January to 140 in February. This was due to the seasonal decline in the prices of slaughter cattle. The index for poultry products showed a further increase for the month, viz. from 141 to 147. This was due largely to the increase in price of eggs.

The index for all groups increased by only 1 point to 125 in February.

The Mealie Position.

The drought during the early part of the summer and the increased local demand for mealies mainly as stock feed caused a relative scarcity of mealies during the past few months. As a result the Mealie Control Board found it necessary, from time to time, to pass additional measures in order to obtain better control of the situation. These measures which have been published in previous issues of this Journal, were—

(*a*) the prohibition of the export of all mealies and mealie products,

(*b*) the cessation of the payment of the rebate of 1s. 6d. per bag on white mealies for stock feed,

(*c*) the fixing of maximum consumers' prices for mealies and mealie products, and

(*d*) the provision that mealiemeal and other maize products could henceforth not be manufactured from white mealies alone, but only from yellow mealies or a mixture of yellow and white mealies.

Although these measures helped to relieve the situation, a maldistribution of supplies continued to exist. Mealies were extremely difficult to obtain in some parts of the country in spite of the fact that, according to the Board's information, there were sufficient supplies to meet the country's most urgent needs until the new crop should become available. Consequently the Board has been compelled to take further steps to ensure that the existing stocks will be properly distributed and, in view of the smaller crop expected this season, to ensure that available supplies will be used as advantageously as possible. In accordance with the powers conferred on the Board by War Regulation No. 20 of 1940 the following additional measures have been adopted:—

(a) The Board will take over all the surplus stocks of traders and millers, i.e., all supplies in excess of their contracts up to the end of April 1942, at 12s. 6d. per bag of 200 lb. for mealies in bags and 11s. 5d. for mealies in elevators for two's and sixes on rail sender's station. Lower grades will be taken over at correspondingly lower prices.

(b) Producers are prohibited from selling mealies to anyone except the Board. Prices have been fixed at 10s. 6d. per 200 lb. for mealies in bags and 9s. 5d. per 200 lb. for mealies in elevators for two's and sixes free on rail. For lower grades correspondingly lower prices will be paid. These prices will be effective until further notice, but not later than 1 May 1942.

(c) The rebate on yellow mealies and mealie products, bought under permit for stock feeding purposes, will also be withdrawn as from 1 March 1942.

Furthermore, the Board will no longer supply mealies direct to consumers in quantities smaller than 110 bags per order. Smaller quantities will be obtained from the trade as usual.

The price at which the Board will sell will be the same as previously, viz., 12s. 9d. per bag f.o.r. elevator or sender's station. Full particulars in regard to all these regulations may be obtained from the General Manager of the Mealie Control Board, P.O. Box 669, Pretoria.

Import Costs of Boxwood and Citrus Pockets.

Although the local manufacture of boxwood has advanced considerably during the past few years, the Union is still largely dependent on foreign countries for its supplies, whereas all of its requirements in respect of citrus pockets (as well as other bags) must be supplied from overseas. Formerly boxwood was imported mostly from the Scandinavian countries and Finland. From 1940, however, when these sources ceased to be available to the Union as a result of war developments, imports were made principally from the United States, Canada, and Brazil.

Prices of boxwood have thus risen considerably since the outbreak of the war as the following figures indicate: The price of 24-inch trays rose from £16 per 1,000 free on rail at the coast in 1939 (pre-war) to approximately £30 in 1941-42. Pear cases rose

from £38 per 1,000 to approximately £78 and apple cases from £39 to £90 in 1941-42.

Import costs of boxwood for deciduous fruit.—The following particulars, obtained from data of actual shipments of boxwood for deciduous fruit, indicate to what extent freight charges, insurance and the free on board value (i.e. the value in the country of origin) have advanced since 1939:—

The free on board value in 1939 (pre-war) in the Scandinavian countries was approximately £18 per standard of 165 cubic feet of boxwood. In 1940 the free on board value of a shipload of boxwood imported from the United States of America was approximately £22 per standard of 165 cubic feet, while from Brazil it was £24 per standard. In 1941 the free on board value of boxwood from the United States of America was approximately £24 per standard and from Brazil approximately £34 per standard.

The advance in freight charges was even greater. Whereas in 1939 (pre-war) it amounted to £4 10s. per standard of 165 cubic feet from the Scandinavian countries to South Africa, it was £20 per standard from the U.S.A. in 1940 and £10 per standard from Brazil. On a consignment in 1941 the freight from the U.S.A. was more or less the same as in 1940, while from Brazil it was approximately £33. 15s. per standard. Insurance, which was only 1s. 2d. per standard from the Scandinavian countries in 1939 (pre-war), was 15s. per standard from the U.S.A. in 1941 and £2. 7s. per standard from Brazil.

Although these figures are not strictly comparable as they are for consignments from different countries, they nevertheless give an indication as to how each of the separate cost items, which all contribute towards the total landed cost, increased since the outbreak of war.

Orange boxes.—The following table gives particulars regarding the import costs of three representative shipments of orange boxes imported in July 1939 (thus pre-war), April 1940 and March 1941. The July 1939 shipment came from Finland, the other two from the U.S.A.:—

Import costs of Orange Boxes (pence per box).

	1939. July.	1940. April.	1941. March.
Free on board value	7·54	8·28	9·97
Freight	2·38	9·42	10·12
Insurance	0·11	0·29	0·36
Landing charges	0·95	0·73	0·58
Landed cost	10·98	18·72	21·13

For the same reason mentioned above, the 1939 figures in this table are not strictly comparable with the rest, but in this case they can also serve as an indication of how import costs per box have risen since the outbreak of the war. From this table it appears that freight rose much more than the f.o.b. value. The latter increased by approximately 32 per cent. from the pre-war price to 1941 (from 7·54d. to 9·97d.) while freight rose by 325 per. cent. Insurance again rose by 227 per cent. over this period. This item however only constitutes a small percentage of the total landed cost. Freight which amounted to approximately 22 per cent. of the landed cost in 1939, constituted approximately 50 per cent. in 1940 and 48 per cent. in 1941. The landed costs rose from 10·98d. in July 1939 to 21·13d. in March 1941. In order to calculate the price paid by the consumer, a few other cost items like railage and importers' profit must, of course, be added to the landed cost. *Orange pockets* as well as all other jute pockets are imported from Calcutta in India. The following table drawn up from data of actual imports show to what extent the landed cost of orange pockets has risen. The figures shown are the averages for the respective periods:—

Import costs of Orange Pockets per 100 *Pockets.*

	1939. (Pre-war).	1940.	1941.
	s. d.	s. d.	s. d.
Free on board value..........................	9 3	17 1	16 9
Freight....................................	1 1	1 8	1 11
Insurance and other costs....................	0 5	0 3	0 4
Landed cost..........................	10 9	19 0	19 0

From the table it appears that the f.o.b. value per 100 citrus pockets has increased by approximately 85 per cent. since 1939. An exceptionally large demand for bags (for sand bags) for approximately 9 months after the outbreak of the war caused a relative shortage of jute bags and prices rose exceedingly. Although the average free on board value in 1941 was somewhat lower than in 1940, it must be pointed out that towards the end of 1941 free on board values again rose considerably owing to a further demand. The free on board value in November 1941 was approximately 22s. 9d. per 100 pockets.

Freight charges have also risen sharply since the outbreak of the war, viz. by 75 per cent. However, as the value per cubic ton of pockets is much higher than that of boxwood, freight constitutes only a small percentage of the total landed cost of pockets. The rise in the price of pockets is therefore due largely to an increase in the free on board value. In this case, too, railage and other costs have to be added in order to calculate the consumers' price.

Index of Prices of Field Crops and Animal Products.

(Basic period 1936-37 to 1938-39=100.)

SEASON (1st July to 30th June).	Summer Cereals, (a)	Winter Cereals. (b)	Hay. (c)	Other Field Crops. (d)	Pastoral Products. (e)	Dairy Products. (f)	Slaughter Stock. (g)	Poultry and Poultry Products. (h)	Combined Index.
WEIGHTS.	19	13	2	3	34	6	17	6	100
1936–37.........	118	86	94	93	122	86	89	98	106
1937–38.........	89	106	112	118	98	112	105	107	101
1938–39.........	92	107	96	89	79	102	106	94	93
1939–40.........	86	106	77	93	116	105	106	89	104
1940–41.........	109	113	106	159	103	108	110	112	109
1941–									
January.......	121	115	98	121	100	104	115	96	109
February......	122	115	92	115	100	104	112	107	109
March........	135	115	87	125	100	104	105	125	112
April..........	126	116	98	167	101	106	108	151	114
May...........	112	116	125	160	101	109	108	157	112
June..........	110	116	126	183	101	111	111	150	113
July...........	112	118	128	241	100	130	118	145	117
August........	111	118	132	216	100	130	119	109	114
September.....	118	118	154	228	100	130	128	108	118
October........	124	119	138	268	100	128	135	115	121
November.....	124	133	110	250	100	128	140	118	123
December......	127	132	135	199	100	122	147	128	124
1942—									
Jan...........	131	133	126	180	100	122	144	141	124
Feb...........	132	133	125	168	101	130	140	147	125

(a) Maize and kaffircorn.
(b) Wheat, oats and rye.
(c) Lucerne and teff hay.
(d) Potatoes, sweet potatoes, onions and dried beans.
(e) Wool, mohair, hides and skins
(f) Butterfat, cheese milk and condensing milk.
(g) Cattle, sheep and pigs.
(h) Fowls, turkeys and eggs.

Average Prices of Lucerne and Teff Hay and Certain Meals for Feeding.

SEASON (1st July–30st June).	LUCERNE (100 lb.).			TEFF Johannesburg. (a) (100 lb.),	MEALS FOR FEEDING: F.o.r. Johannesburg.				
	Johannesburg (a).		Cape Town, Cape 1st Grade.		Lucerne. (100 lb.).	Monkey Nut Cake (200 lb.).	Oats, Sussex Ground (150 lb.).	Bone, 24·8% Protein (100 lb.).	Mixed, 26·4% Protein (100 lb.). (b)
	Cape	Trans-vaal							
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
1938–39.........	3 11	3 1	4 0	2 7	6 9	15 2	15 4	8 5	8 0
1940–41.........	4 2	3 5	4 3	3 3	6 7	15 3	14 8	11 2	8 7
1941—									
January.......	3 9	3 2	4 0	3 9	6 6	15 0	14 6	11 0	8 6
February......	3 9	2 8	4 1	2 8	6 6	14 6	14 0	11 0	8 6
March.........	3 6	3 0	4 5	2 7	6 6	14 0	14 0	11 0	8 6
April..........	4 0	3 11	5 0	2 10	6 6	14 6	14 0	11 0	8 6
May...........	5 3	3 10	5 0	2 10	6 9	14 6	14 6	11 0	8 6
June..........	5 3	4 9	5 5	3 1	7 0	15 6	15 0	11 0	9 6
July...........	5 2	5 2	5 10	3 10	7 6	15 6	16 0	11 0	9 6
August........	5 6	6 3	5 11	3 3	8 0	—	17 0	11 0	9 6
September.....	6 5	6 1	5 7	3 9	8 6	16 0	17 6	11 0	9 6
October........	5 8	5 6	5 1	3 10	8 6	—	17 6	11 0	9 6
November.....	4 5	3 11	4 11	3 6	8 6	—	—	11 0	9 6
December......	5 3	4 10	4 9	4 10	7 6	—	17 6	10 6	9 6
1942—									
January.......	4 10	4 7	5 1	4 11	7 6	—	17 6	10 6	10 3
February......	4 11	4 8	5 5	4 4	7 6	—	17 6	10 6	10 3

(a) Municipal Market. (b) Approximately half of the protein is claimed to be animal protein.

Average Prices of Potatoes and Onions on Municipal Markets.

Season (1st July to 30th June).	Potatoes (150 lb.).						Onions (120 lb.).		
	Johannesburg.				Cape Town.	Durban.	Johannesburg.	Johannesburg.	Cape Town.
	Transvaal No. 1.	Transvaal No. 2.	N.M. Grade 1. No. 2.	N.M. Grade 1. No. 3.	Cape No. 1.	Natal No. 1.	Transvaal.	Cape.	Cape.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
1938-39	6 9	6 2	8 10	8 1	8 3	8 10	8 3	8 10	7 4
1940-41	14 2	13 4	18 6	18 5	15 7	16 10	12 5	12 3	9 10
1941—									
January	11 4	10 1	12 4	11 7	10 2	14 4	7 3	7 3	4 7
February	8 9	8 2	12 1	11 9	14 2	11 0	6 9	7 4	4 10
March	10 10	10 7	13 9	13 8	13 0	13 5	8 1	8 10	5 4
April	14 8	14 10	19 9	19 0	19 4	17 11	8 11	9 9	7 8
May	15 3	14 4	21 1	20 11	16 9	17 11	9 9	10 3	7 6
June	17 9	17 10	22 10	22 7	18 2	21 4	10 8	13 2	9 5
July	22 9	23 5	28 0	28 5	26 8	27 6	16 1	16 1	12 11
August	18 10	19 10	26 10	27 2	24 8	24 9	13 0	19 0	15 3
September	19 2	20 1	25 1	24 8	28 0	26 7	17 1	16 9	13 9
October	26 0	24 10	28 8	28 8	33 5	29 8	11 3	17 1	12 11
November	25 0	24 3	34 1	32 11	26 10	29 8	9 1	—	10 1
December	21 5	20 1	22 2	21 11	14 9	24 8	10 3	12 4	8 1
1942—									
January	18 8	16 4	20 6	18 11	15 3	23 2	9 3	10 2	7 10
February	15 9	13 11	20 11	20 5	16 3	20 3	9 10	9 9	7 0

Average Prices of Green Beans, Green Peas and Carrots on Municipal Markets.

Season (1st July to 30th June).	Green Beans (Pocket 20 lb.).			Green Peas (Pocket 20 lb.).			Carrots (Bag). (a)		
	Johannesburg.	Cape Town.	Durban.	Johannesburg.	Cape Town.	Durban.	Johannesburg.	Cape Town.	Durban.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
1938-39	1 8	2 3	2 0	2 4	1 9	1 2	3 8	2 6	6 1
1940-41	1 11	2 9	1 5	2 8	2 4	2 3	5 9	4 11	13 4
1941—									
January	1 5	—	1 3	2 11	2 8	2 9	4 8	2 1	5 5
February	1 9	1 9	1 7	2 9	—	2 6	7 11	3 0	15 1
March	1 6	1 8	1 5	3 7	4 8	2 9	9 2	3 2	13 7
April	1 10	2 5	0 9	2 9	2 8	2 9	8 7	3 8	19 5
May	1 5	2 4	1 5	3 4	3 2	1 10	6 7	5 8	13 9
June	3 0	3 5	2 11	4 6	3 6	2 2	6 4	9 0	13 3
July	6 4	6 0	6 11	6 6	3 9	5 1	8 5	9 9	10 11
August	3 0	3 7	3 10	3 6	3 0	3 8	10 4	11 6	16 8
September	2 9	4 6	3 1	3 4	3 3	2 1	8 10	9 0	12 2
October	2 0	3 9	1 9	2 5	2 0	3 6	6 4	7 1	12 10
November	2 1	3 5	1 5	4 0	2 6	4 3	7 6	7 10	3 8
December	3 1	1 7	2 2	7 2	3 9	4 2	7 6	6 1	12 3
1942—									
January	2 4	0 8	3 1	6 4	—	4 8	5 9	7 8	11 6
February	2 1	1 4	1 7	2 6	—	2 7	10 0	11 6	19 1

(a) Weights of bags vary, but on the average are approximately as follows:—Johannesburg, 130 lb.; Cape Town, 90 lb.; and Durban, 120 lb.

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FARMING IN SOUTH ... AFRICA
Vol. 17 MAY 1942 No. 194

Editorial:

Plant More Winter Cereals.

Owing to a combination of circumstances, there is grave danger that the Union of South Africa will shortly be confronted with a serious food shortage. In the first place, war conditions have brought about an enormous increase in home consumption. Secondly, during the past season and the latter half of the previous season, the Union experienced an unprecedented drought which led to an enormous decrease in the production of both cereals and animal products. Thirdly in parts of the O.F.S. and Transvaal a large percentage of the grazing, the hay crop and even the maize crops was destroyed by the army worm, with the result that the production of animal products will be adversely affected during the coming winter.

In order partially to meet this shortage, all farmers residing in areas where winter cereals can be successfully cultivated are advised to plant as many of the suitable varieties of winter cereals as possible.

The eastern and western Transvaal Highveld and the north-western O.F.S. are not regarded as winter-cereal areas and it has always been the policy of the Department not to recommend the production of winter crops in these parts.

Owing to the drought and the devastation caused by army worms thousands of morgen of arable land are, however, to-day, lying fallow in the above parts. In consequence of unfavourable conditions no crops could be cultivated on the lands in summer and the same will probably be the case this winter.

The possible danger of a shortage of food has compelled the Controller of Food Supplies, as an emergency measure, to appeal to all farmers in the above-mentioned areas to do everything within their power to plant some fodder or cereal crop for the winter on these lands. This appeal must not be regarded as a divergence from the well-known policy of the Department of Agriculture and Forestry, but merely as an emergency measure, designed to obviate the possibility of sources of possible food production remaining unexploited.

Of course, farmers must face the risk of experiencing unfavourable weather conditions during winter, if they plant for green feed, or during both winter and autumn if they plant for grain as well as green feed. After the good rains experienced recently, germination and growth should be fairly safe in the eastern highveld areas and even in the cool soils of the western areas until winter sets in in earnest.

The Department has already indicated in press articles and in radio broadcasts how wheat, rye and peas can be cultivated advantageously during the coming winter to furnish food for human and animal consumption. Hints have also been given with regard to the advantageous ensiling of late maize and the more effective conservation of maize stover and leaves by cutting the material when the grain is in the flint stage, instead of harvesting in the old manner.

The above hints are given as an urgent appeal to farmers to leave no lands unproductive at this stage, and to take pains not to waste

valuable animal food. Not only must production be maintained, but it must be increased to meet the increasing consumption.

A warning must, however, be given in this connection. Numerous cases are on record in history where farmers in their zeal to produce, and encouraged especially by attractive prices, have injudiciously ploughed soils which should never have been ploughed, owing to the danger of erosion. This is the case with lands which have too steep a slope, which possess physical or chemical properties of such a nature that it will be productive for only a limited number of years, after which it will become exhausted to such an extent that the elements of nature, such as wind and water cause erosion of the worst degree. In some countries where, during the last war, food was produced blindly regardless of ecological conditions, deserts were created. South African agriculturists must guard against similar destruction of good soils.

The appeal for production during the coming winter is, therefore, particularly applicable to cultivated lands which are at present lying fallow owing to unfavourable conditions during the past season. It does not refer to new soil.

Farmers are strongly advised to consult their nearest Extension Officer or College of Agriculture, if in doubt.

The policy recommended for the coming summer season will be published at a later stage.

(Prof. A. M. Bosman, Director of Food Production.)

Effect of Karoo-Manure Ash on Soil.

OWING to the dislocation in the supply of fertilizers normally used to improve the production capacity of soil, farmers are being encouraged to use Karoo ash and Karoo ash mixed with Karoo manure as fertilizers. Under the climatic conditions which prevailed during the past season, the ash, or the mixture of ash and manure, apparently yielded good results in certain districts.

The use of Karoo ash as well as the mixture of ash and manure will prove very injurious to the soil, and farmers are seriously warned not to make any use of this substitute for fertilizers. Our cultivated soils, especially wheat-producing soils, are deficient in humus, and with the combustion of the manure all the humus and organic material necessary to the soil is destroyed. The ash consists of a potent concentration of dangerous alkaline salts; even the potash contained in the ash occurs in a form capable of scorching the crops and damaging the structure of the soil. As it is, Karoo manure, as such, contains an undesirable quantity of alkaline salts so that the risk of making the soil brackish is all the greater when the ash or a mixture of ash and manure is applied. The result of the application of ash or a mixture of ash and manure will be the occurrence of black brak after a few years. This means that the structure of the soil will deteriorate as a result of which the soil will be difficult to cultivate and will to a large extent lose its water-absorption capacity. Under such conditions, crops will grow only with difficulty, and in years with a low rainfall will be scorched.

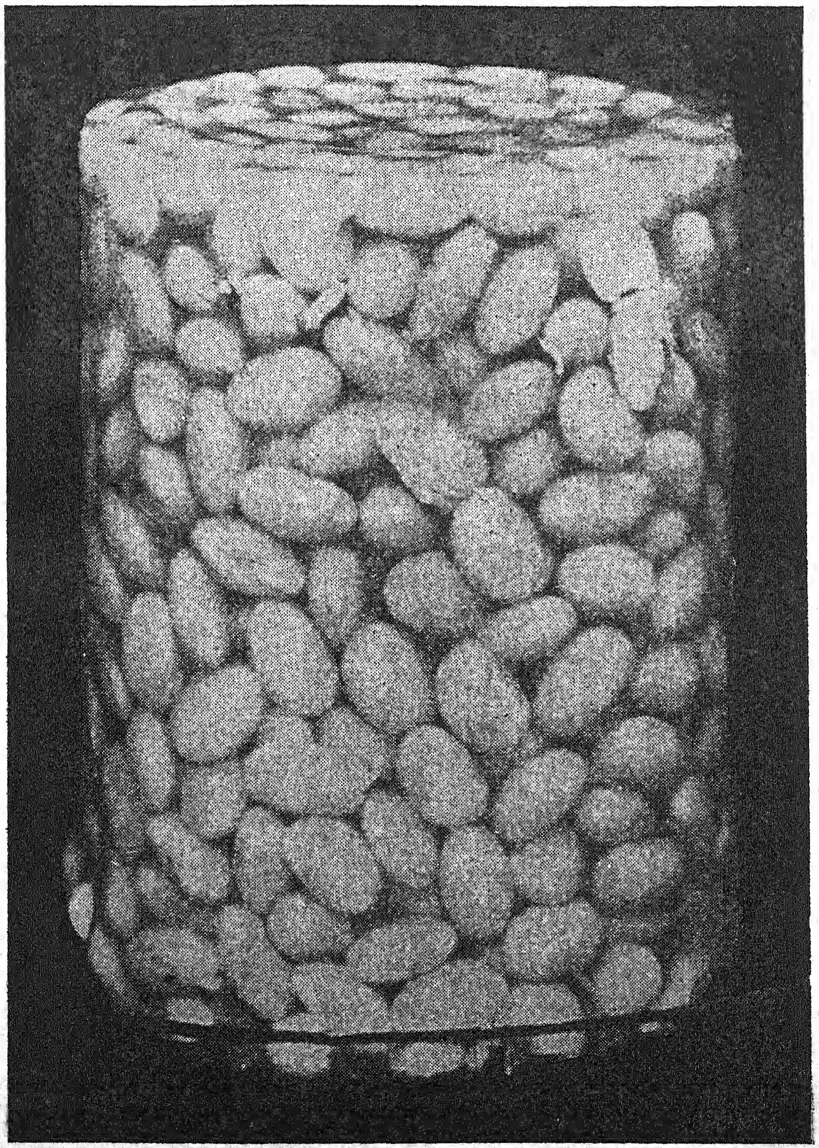
All farmers who feel uncertain about this matter are advised to consult their nearest College of Agriculture in order to obtain further information in connection with this problem.

(Secretary for Agriculture and Forestry.)

The Canning of Soybeans.

Low Temperature Research Laboratory.

IN view of the growing interest in the production of soybeans in South Africa and in view of the highly nutritive qualities of this legume, it has been decided to commence investigations in regard to its canning possibilities. One of the South African non-shattering



Soybeans, canned in 2 per cent. brine, after a few weeks' storage at room temperature.

types (Potch. 256), which is comparatively free from bitterness, has been selected for the tests.

The nutritive value and the bitter principle of soybeans generally have been investigated and the actual tests comprised the canning of the above-named beans in brine, in brine and sugar, in tomato sauce and in vinegar (sousbootjies).

In the case of beans canned a year after harvesting a very slight bitter taste could be detected and white spots developed in the canned product when stored at high "tropical temperatures (98° F.)". Fresher beans from the next season's crop, however, which were canned only 4 months after harvesting remained entirely free from bitterness and no white spots developed at any of the storage temperatures, even up to 130° F. The canned beans invariably proved to be of excellent flavour and texture, particularly upon heating. After a few weeks' storage of the beans canned in brine, the covering liquid gelatinized; this is clearly shown in the accompanying photograph of a pack of soybeans after careful removal from the can. In the case of soybeans canned in vinegar sauce—which made a very appetizing dish—there was no gelatinization upon storage.

The beans canned in tomato sauce proved an excellent dish and the palatability and consistency were also well retained during prolonged storage.

In all cases the processing occurred at 240° F., with an "initial can temperature", i.e., for exhausting, of approximately 170° F. Processing at higher temperatures for correspondingly shorter periods proved unsatisfactory, owing to darkening of the products and development of bitter flavour, for instance, in the tomato sauce.

Only one size of can was used for these tests, namely the A1 (211 × 400) type. The different processing times for the different packs are evident from the fact that a total time of 70 minutes was required for soybeans in brine, whilst 100 minutes were required for the beans in tomato sauce.

It may be noted in conclusion that the use of lacquered cans of the sulphur-resistant type proved essential for these products in order to avoid "purpling" of the cans and the brownish-black deposits associated with stannic and iron sulphides.

(Copies of the detailed report are available on application to the Government Low Temperature Research Laboratory, P.O. Box 3, Cape Town.)

Popular Bulletins.

(1) Calf Rearing—Bulletin No. 224. Price 3d. Obtainable from the Editor, Department of Agriculture and Forestry, Pretoria.

(2) The Export of Fresh Grapes from the Union of South Africa during the Ten-year period, 1930-39—Bulletin 225. Price 6d. Obtainable from the Chief, Division of Horticulture, Pretoria.

(3) Soft Cheese as a Food—Bulletin No. 229. Price 3d. Obtainable from the Editor, Department of Agriculture and Forestry, Pretoria.

Cultivation of Peas.

E. F. Malan and J. J. du Toit, College of Agriculture, Potchefstroom.

IN areas where severe cold is experienced during winter, the time for sowing most winter vegetables has already passed, but peas constitute one of the important crops which may still be planted.

Peas are sensitive to heat and prefer a cool climate. The plants are able to resist cold until they reach the flowering stage, when they become susceptible to damage by frost. The time of planting should, therefore be arranged so as to avoid all risk of late cold spells when the plants enter upon the flowering stage. To yield the best results, the crop requires regular moisture conditions throughout the growing period, and since adequate winter rains do not as a rule occur in the summer rainfall area, the cultivation of the crop in that area depends chiefly on irrigation.

Time of Planting and Soil Requirements.

In areas experiencing very cold winters, the latter half of May is the most suitable time for planting peas under irrigation; in areas free from frost, planting may take place from April onwards. Where a portion of the crop is marketed in the form of green peas, the seed may, if desired, be planted at intervals of 14 days until early in spring.

Peas may be grown on most types of soil, provided the soil is well-drained and reasonably fertile. Sweet loamy soils, rich in humus, usually yield the best results. The crop requires comparatively heavy applications of fertilizer. Eight to ten tons of well-rotted kraalmanure or compost, together with 600 lb. of superphosphate per morgen may be worked into the soil approximately 4 weeks before planting. Where kraal manure is not available, approximately 600 lb. of fertilizer mixture D(3 : 13 : 3) may be used. Where the preceding crop, such as potatos or tomatoes, received heavy applications of fertilizer, further applications are not essential.

Varieties and Methods of Planting.

Preference is usually given to the so-called dwarf varieties, especially the wrinkled types. For planting in May, Greenfeast, Stratagem, Wiehahn's Crescent and Perfection are popular varieties. For planting during spring, Black-Eye Susan is perhaps the most suitable since it is more resistant to unfavourable conditions generally. It is, however, less palatable than the other varieties, on account of its lower sugar content.

When grown on a small scale, peas may be planted by hand in shallow drills at intervals of two to three feet. When grown on a large scale, however, an ordinary double-row maize planter is usually more effective. In this case it is essential either to remove the springs under the shoes over the plates in the hoppers, or to retain only half a spring under each in order to prevent breaking of the seed. Dense planting is advisable, i.e., a spacing of 2 to 3 inches in the rows.

Poor germination may be expected if the seed is immature or too old, or if moisture and soil conditions are unfavourable. Most successful germination, especially in heavy soil, is obtained if the seed is planted in moist soil without irrigation until the seedlings

 Continued on page 298.

Studies on Merino Wool Production.

Fleece Density Tests on a Group of Extremely Plain-bodied Stud Rams.

Dr. V. Bosman, Senior Wool Research Officer, Onderstepoort.

IN merino sheep, density is an important fleece characteristic and the degree of density is one of the main features distinguishing the fleeces of flock sheep from those of stud sheep. In a previous publication* it was shown that flock sheep usually have from 15,000

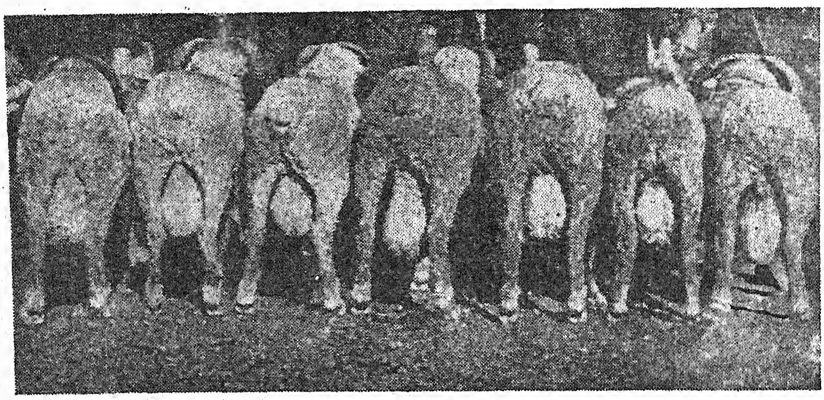


Fig. 2.—The strong hindquarters of the rams described in the article, which are characteristic of their type.

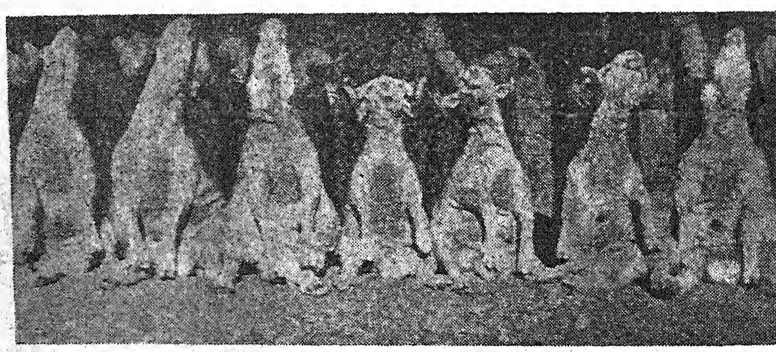


Fig. 3.—The well-developed chests and forequarters of the rams described in the article, which are characteristic of their type.

to 25,000 fibres growing per square inch of skin, whereas "stud" sheep possess from 30,000 to 60,000 fibres per square inch of skin.

It has also been shown that in the case of a stud ram that has a staple length of 4 inches and a 60's quality number, every 10,000 fibres per square inch of skin adds 2¾ lb. of clean dry wool to the fleece, or 7 lb. to the greasy fleece when it has a 45 per cent. yield.

* "Precision in Judging and Classifying the Merino Fleece"—V. Bosman, *Farming in South Africa*, May 1933.

Many sheepmen believe that fleece density must be associated with the presence of skin-folds and that the fleece of the plain-bodied ram must necessarily lack density so that the ram is threfore an inferior animal. Others contend that the plain-bodied animal can possess as compact a fleece as the developed sheep, but the matter has been, and still is, a controversial topic among sheep breeders.

In this publication the fleece-density tests of a group of extremely plain-bodied merino stud rams are given.

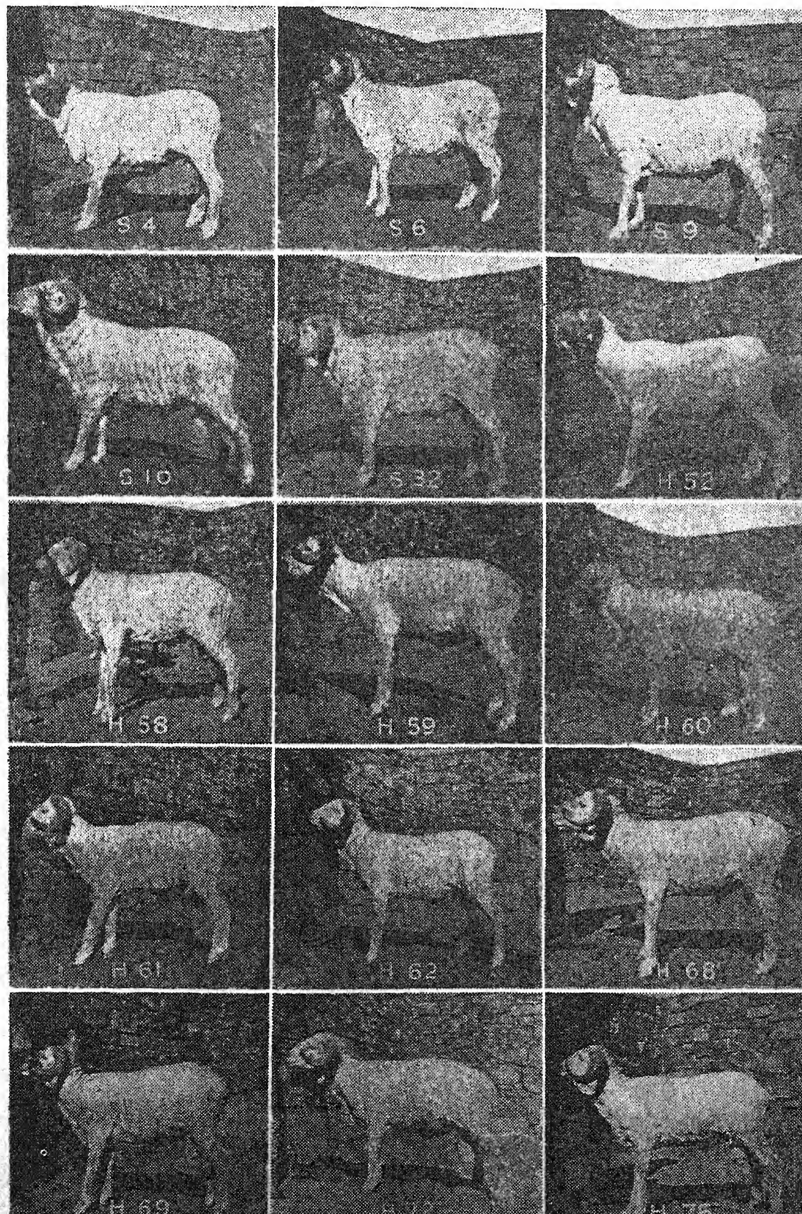
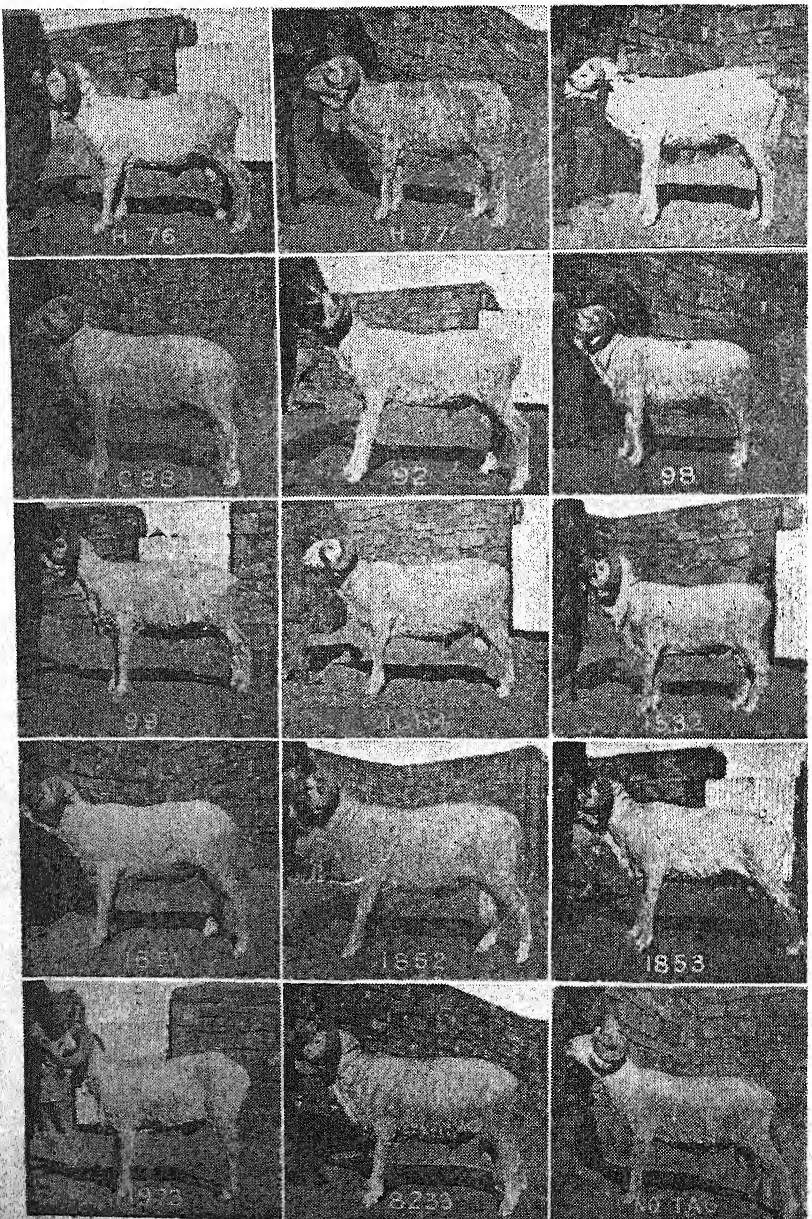


Fig. 1.—The plain-bodied stud rams whose fleece densities are given in the accompanying table.

Description of Rams.

The rams illustrated in Fig.1 are the stud sires of a stud breeder who is breeding extremely plain-bodied sheep. Both the stud ewes† and the stud rams are of the same type, and a system of mating like

† A group of ewes from this stud has been described in a previous issue of this Journal—"Studies in Merino Wool Production—the fleece analysis of a group of plain-bodied stud ewes."—V. Bosman, *Farming in South Africa*, February 1942.



to like has been practised. No type other than the extremely plain-bodied animal is tolerated in the stud.

The rams are illustrated in their shorn state to show their true plainness in contrast with the method often followed by breeders in presenting the animals with a fully grown fleece, thus giving an apparent and deceptive plainness.

The stud rams are typical of their type and possess strong constitutions and good conformations, some aspects of which are illustrated in Figs. 2 and 3.

The rams were run on Karroo veld without any supplementary feeding and, since they are the top sires in their stud, they were heavily used.

Tests on Fleece Density.

The fleece-density tests obtained on the shoulder regions of 36 stud rams are given in the accompanying table.

The results of fleece density tests on the shoulder regions of the extremely plain-bodied stud rams illustrated in Fig. 1.

The number of fibres growing per square inch of skin ranges from 29,100 to 52,100, with an average for the group of 40,900,

Ram.	Age (as no. of teeth).	No. of fibres per sq. inch (shoulder).	Fibre fineness.	Quality No.	Fleece density as percentage of skin area.
S. 4	4	45,200	21·3	60's	2·57
S. 6	4	31,800	22·8	60's	2·06
S. 9	4	38,900	22·7	60's	2·53
S. 10	4	39,500	23·2	58's	2·67
S. 32	4	39,000	24·5	58's	2·91
H. 51	2	37,600	19·8	66's	1·87
H. 52	2	44,800	20·2	64's	2·30
H. 53	2	47,600	20·0	64's	2·43
H. 54	2	53,200	21·4	60's	3·06
H. 58	2	32,400	21·6	60's	1·90
H. 59	2	48,600	21·7	60's	2·96
H. 60	2	43,600	20·3	64's	2·29
H. 61	2	33,700	19·3	66's	1·58
H. 62	2	52,100	18·1	70's	2·18
H. 68	2	38,400	21·3	60's	2·18
H. 69	2	38,400	21·6	60's	2·24
H. 72	2	33,200	21·7	60's	1·99
H. 73	2	37,300	21·7	60's	2·19
H. 75	2	36,200	22·1	60's	2·26
H. 76	2	43,200	21·0	64's	2·41
H. 77	4	43,500	20·4	64's	2·28
H. 78	2	51,000	19·2	66's	2·37
C. 88	6	44,600	21·9	60's	2·73
92	4	45,600	20·0	64's	2·29
98	4	48,000	21·6	60's	2·82
99	4	39,100	20·8	64's	2·13
1284	8	39,800	22·8	60's	2·60
1532	6	35,800	23·2	58's	2·41
1585	8	45,300	21·8	60's	2·72
1851	6	30,300	22·6	60's	1·95
1852	6	44,200	22·1	60's	2·72
1853	6	30,200	23·6	58's	2·10
8233	6	29,100	23·2	58's	1·95
No Tag (1)		38,300	22·8	60's	2·49
No Tag (2)		44,500	21·1	64's	2·45
No Tag (3)		49,200	21·9	60's	2·96
Averages		40,900	21·5	60's	2·38

which represents a good stud standard. Since the number of fibres per unit area alone does not signify the actual compactness of the fleece†, the fibre fineness must also be taken into account. This and the true fleece density are respectively given in the 4th and 6th columns of the accompanying table.

In the 6th column of the table the fleece-density, defined as the percentage of skin area occupied by wool fibre, ranges from 1·58 to 3·06, with an average of 2·38. This value compares well with similar tests on many outstanding merino stud rams.

Conclusion.

The standard of fleece-density of the plain-bodied stud rams, when compared with other available density tests, shows that these rams possess a relatively high standard of compactness. From the density point of view these rams must be regarded as representing a good stud standard and the contention, still widely held by many sheepmen, that a high degree of fleece-density must necessarily be associated with body-folds, cannot be substantiated.

This conclusion confirms that arrived at in the February 1942 issue of this Journal on plain-bodied stud ewes, in which the practical advantages of the plain-bodied type were stressed.

* "Biological Studies on South African Merino Wool Production"—V. Bosman, The Journal of the Textile Institute (1937).

Cultivation of Peas—

Continued from page 293.

are well established. The best depth of planting is approximately $1\frac{1}{2}$ to 2 inches.

The quantity of seed required per morgen varies from 100 to 140 lb. depending upon spacing and the size of the seed.

Cultivation, Harvesting and Marketing.

Regular cultivation must be started at an early stage, in order eradicate weeds and to keep the soil loose. When the plants are well advanced, light ridging will be found advisable in order to facilitate irrigation between the rows. In mid-winter, loss of moisture is comparatively low, and irrigation every 12 to 14 days will be adequate. In late winter when the warm weather stimulates growth, and when the plants come into flower, more frequent irrigation will be necessary.

Green peas for the market must be picked as soon as the pods are well-filled and before they begin to harden. Each land should be picked at least two or three times, since the pods will not all be ready for picking at the same time. A certain amount of grading takes place in the field during the picking process since immature pods and those that have become dry or damaged by frost are left on the plants. Particulars with regard to the grading and packing of green peas may be obtained from the Inland Marketing Bureau, P.O. Box 8045, Johannesburg. The peas should be marketed as soon as possible after picking.

Where the crop is grown to be marketed in the form of dry peas, the plants are uprooted when most pods have ripened. When dry, the peas may be threshed by trampling or flailing or in a suitable threshing machine.

Yields of from 300 to 800 pockets of green peas of 20 lb. each per morgen may be obtained under reasonably favourable conditions. In the case of dry peas, from 6 to 12 or more bags may be obtained per morgen.

The Maturing Potato Crop.

D. W. McKellar, Lecturer in Field Husbandry, Grootfontein College of Agriculture, Middelburg, Cape.

THE main potato-crop season is drawing to a close, but the grower's problems are not at an end until he has marketed his crop.

One of the factors determining the quality of potatoes is absence of insect damage, and it is not always appreciated that cultural practices may have a direct bearing on the degree of infestation from a pest such as the potato tubermoth. Ridging of the growing crop is a practical method of preventing extensive damage, especially on soils which tend to crack and expose the developing tubers. Tubermoth infestation varies in intensity from year to year, and may affect over 30 per cent. of the total crop when the plants are not ridged. Ridging is commonly practised in South Africa, but it should be remembered that the crop is vulnerable to attack not only during growth, but also after maturity. For this reason, when ridging is practised, it should be done effectively, and if for some reason the crop cannot be lifted immediately after maturity, care should be taken that the rows remain well ridged. An additional reason for ridging is to prevent greening as a result of exposure to light coming through cracks in the soil.

Lifting and Storing of Potatoes.

Tubers should be bagged as soon as possible after harvesting, and in order to prevent the tubermoth, which is mainly a night flier, from ovipositing in the tubers, it is particularly important to ensure that they are not left lying on the soil overnight.

The time for lifting or harvesting the potato crop is usually regulated by the prevailing market prices and storage facilities. Normally, the crop would not be lifted till the plants have died down and the skins of the tubers have hardened, since the greatest tuber development takes place during the last few weeks of active growth, and well-matured tubers keep better than do those which are harvested prematurely. On occasion, however, attractive market prices justify early harvesting, the smaller yields obtained being more than compensated for by the higher ruling prices.

If conditions are abnormally warm in autumn and the soil is moist the matured tubers left in the soil sometimes tend to sprout. When such conditions prevail, or when a crop matures early owing to early planting, the potatoes should be examined carefully, and if they tend to sprout they should be lifted and the tubers either marketed immediately or stored in a cool spot.

Potatoes may be stored either in or out of the soil. In areas where the winters are cold and the crop matures at the end of summer, the tubers may be conveniently left in the soil till they are required, unless the ground has to be prepared immediately for a winter cereal. The alternative is to lift and bag the crop and to store the bags in some cool place. Lack of suitable storage accommodation often precludes this procedure from being followed, especially if the crop is large, when pitting (clamping) is an effective and easy method of storage. By pitting is meant the placing of tubers in long, narrow heaps in a cool, sheltered and well-drained spot, for instance, adjacent

Continued on page 304.

The Spread of Prickly Pear in the Union.

Roscar du Toit, Professional Officer (Weed Control),
Division of Soil and Veld Conservation.

A FEW years ago when the prickly pear (*Opuntia megacantha*) was proclaimed a weed in terms of Weeds Act, No. 42 of 1937, parts of the Eastern Cape Province were by then so densely infested that it was impossible for farm owners to meet the cost of controlling the weed. The Department was, therefore, compelled to demarcate the area concerned and to reserve it for biological control by means of the cactoblastis and cochineal insects and to render assistance in this manner. The biological area comprises the districts of Victoria East, Fort Beaufort, Stockenström, Albany, Bedford, Somerset East, Uitenhage, Steytlerville, Jansenville, Pearston, Cradock, Graaff-Reinet, Ladismith, Adelaide, Port Elizabeth, Middledrift and Mossel Bay as well as wards in Alexandria, Peddie, Humansdorp, Murraysburg, Aberdeen, Willowmore, Steynsburg, Middelburg (C.P.), Oudtshoorn, Tarka, Riversdal, Bathurst and Victoria West. (See chart.)

Table showing the extent of infestation in the areas concerned.

AREA I (Transvaal).

District.	Number of Farms Visited.	Morgen Infested with Prickly Pears.	
		Dense.	Light.
Potchefstroom	29	278	719
Klerksdorp	20	484	1,800
Wolmaransstad	21	60	370
Christiana	6	19	1
Bloemhof	2	4	6
Lichtenburg	8	18	68
Schweizer Reneke	7	63	25
Ventersdorp	5	37	105
Potgietersrust	6	42	9
Waterberg	4	33	39
Pietersburg	53	1,935	1,220
Middelburg (Transvaal)	16	322	513
Rustenburg	76	1,422	4,862
Marico	41	262	1,583
Brits	14	150	354
Krugersdorp	5	5	23
Lydenburg	61	4,624	10,691
Pretoria	21	223	652
Zoutpansberg	3	8	4
Heidelberg	4	5	7
Vereeniging	2	—	3
Johannesburg	3	1	2
TOTALS	407	9,995	23,056

In order to assist farmers residing outside the biological area, the Department issued arsenic pentoxide free to applicants who wanted to control the weed by chemical means. It soon became apparent, however, that there were numerous infestations outside the boundaries of the biological areas which the owners could not possibly bring under control at a reasonable ccst, either by chemical or mechanical means. These densely infested patches were widely scattered throughout the Union and could, therefore not be readily incorporated in the biological area.

AREA II (Orange Free State and part of the Cape Province).

District.	Number of Farms Visited.	Morgen Infested with Prickly Pears.	
		Dense.	Light.
*Boshof	43	149	634
Jacobsdal	35	25	367
Bloemfontein	93	309	3,925
Brandfort	14	94	684
Hoopstad	20	253	167
Bothaville	39	20	78
Vredefort	38	75	61
Kroonstad	29	47	37
Winburg	16	163	1,197
Dewetsdorp	3	—	—
Smithfield	82	7	779
Rouxville	85	63	5,785
Ladybrand	24	499	1,535
Ficksburg	9	75	324
Senekal	73	440	1,933
Lindley	4	6	2
Reddersburg	11	4	166
Clocolan	23	335	1,467
Barkly West	20	83	3,586
Kimberley	44	46	1,185
Philipstown	127	1,113	5,539
Burghersdorp	43	346	11,902
Aliwal North	19	102	1,768
Venterstad	63	751	8,238
Steynsburg	36	197	10,203
Molteno	13	37	218
Wodehouse	5	37	365
Lady Grey	18	381	2,155
De Aar	35	21	133
Colesberg	59	129	9,320
Hanover	63	54	51
*Fauresmith	19	282	3,243
†Philippolis	31	53	10,454
Bethulie	54	74	5,776
Trompsburg	11	7	4,200
Edenburg	19	88	2,109
Zastron	13	62	3,333
Wepener	4	—	32
Fouriesburg	1	—	60
Herbert	38	160	2,536
Hope Town	19	15	110
TOTALS	1,395	6,602	105,657

* Infestations are considered to be twice as severe if the rest of the district is also taken into consideration.

† The infestation is one-third more severe if the rest of the district is also taken into consideration.

Just at this time a cochineal species produced very promising results and the Department decided, after due consideration, to release this insect (*Dactylopius opuntiae*) in dense infestations outside the biological area. That this decision was justified, in spite of the possibility of damage being caused to spineless cactus plantations, is best illustrated by the accompanying chart which shows diagrammatically how extensively the prickly pear has already spread; and that, from a few plants introduced towards the end of the 18th century. It should also be borne in mind that the Government and

Area III (Natal and part of the Orange Free State).

District.	Number of Farms Visited.	Morgen Infested with Prickly Pears.	
		Dense.	Light.
Weenen	86	601	13,543
Umvoti	37	30	2,905
Bergville	25	3	39
Estcourt	34	205	3,538
Klipriver	52	545	4,879
New Hanover	1	¼	5
Helpmekaar	4	108	4,575
Dundee	5	¼	3
Kranskop	3	500	1,500
Ixopo	1	½	—
Lower Tugela	2	½	2
Lower Umfolosi	2	½	½
Pietermaritzburg	5	5	8
Totals	257	1,997	30,997½

the Provincial Administrations have for years been alive to the danger and have spent considerable sums in order to control the weed. In practice, however, the best mechanical and chemical methods could not effectively control the prickly pear menace. The same difficulty was experienced in Australia. Biological control which is both economical and effective, is the only means of controlling the weed to such an extent that the complete subsequent eradication by mechanical and chemical methods is made possible.

Protection of Spineless Cactus.

The fate of the spineless cactus (Burbanks) plantations was fully considered. Only the new cochineal insect (*D. opuntiae*) is liberated outside the biological area. This insect is dependent mainly on the wind for its dispersal. The young males are able to fly a short distance but do no damage since they die soon after mating. It is the female which carries on the work of destruction. She is blown about by the wind while young, but immediately after having mated she anchors herself to one spot and cannot move again. Spineless cactus plantations can be protected (1) by *not* liberating cochineal insects in the *immediate* vicinity of such plantations; (2) by eradicating all prickly pear plants which form a connecting link between the infested plants and the spineless cactus plantation, so that the wind cannot bring about the gradual approach of the insect; (3) by inspecting the spineless cactus plantation regularly and removing all cochineal

insects which may be found. The white woolly "bug" can easily be detected with the naked eye.

A question often asked is: "How far from a plantation of spineless cactus can cochineal insects be released with safety?" It is impossible to give a definite answer since so much depends on local conditions, as for example, the velocity and direction of the prevailing winds. It is, therefore, very difficult to decide upon a definite

AREA IV (Western and North-Western Cape Province).

District.	Number of Farms Visited.	Morgen Infested with Prickly Pears.	
		Dense.	Light.
Calitzdorp	22	225	2,008
George	3	6	15
Uniondale	28	32	545
Piquetberg	19	15	mostly hedges.
Paarl	9	5	,,
Clanwilliam	8	5	,,
Malmesbury	12	4	15 hedges
Robertson	3	20	170
Beaufort West	3	—	10
Riversdale (not biological area)	8	36	145
Heidelberg (C.P.)	30	356	2,107
Swellendam	35	207	3,400
Richmond	5	8	105
Victoria West	4	11	115
Britstown	4	—	4
Murraysburg (not biological area)	6	—	11
Fraserburg and Williston	2	—	4
TOTALS	187	930	10,654

margin of safety for general use. Farmers are advised not to liberate cochineal in the *immediate* vicinity of their plantations. If the instructions contained in the previous paragraph are carefully observed, spineless cactus plantations will be safe.

The control of prickly pear by means of the cochineal insect is not compulsory outside the biological area; the insect is used only in cases where infestations are so dense and extensive that eradication by mechanical or chemical means has become impossible. The prickly pear spreads very rapidly and is already found in most districts of this country. Every effort must be made to get the weed under control, otherwise it may become a serious menace, which it already is in the biological area, where approximately 1,000,000 morgen of valuable land have been rendered useless.

Distribution of the Prickly Pear Pest.

During the years 1939 to 1941 the weed inspectors of the Division of Soil and Veld Conservation made a survey of the extent to which the prickly pear had spread in the Union. It was impossible to cover all the farms or even all the districts properly. All the worst infestations were surveyed, however, so that the figures given below and the position indicated by the accompanying chart, by no means exaggerate the true state of affairs. This survey entailed the visiting

of 2,869 farms on which 21,020 morgen were found to be densely infested and 342,901 morgen lightly infested. The chart shows how the plants have spread from the east to the north. Unfortunately no survey was made of the Transkei Native Territory and Basutoland, otherwise the representation of the distribution of the weed would have been more complete. It is quite clear, however, that the prickly pear is now found practically everywhere. It is, therefore, a great potential danger against which every occupier of land and/or farmer must guard.

Every farmer can make a simple test by counting all the young plants to be observed within a radius of, say, half a mile from an old existing infestation. He will be surprised to find how rapidly the pest is spreading. Once he is convinced that the prickly pear must be controlled, no time should be lost in doing so. If he does not know how to set about the matter, he should write for advice to the Chief, Division of Soil and Veld Conservation, P.O. Box 965, Pretoria.

AREA V (Eastern Cape Province).
(Only districts outside the biological area were surveyed.)

District.	Number of Farms Visited.	Morgen Infested with Prickly Pears.	
		Dense.	Light.
Aberdeen	27	—	55,9054
Alexandria	20	21	52
Bathurst	28	294	924
Cathcart	22	115	3,831
East London	5	3	6
Keiskama Hoek	37	20	22
Kingwilliamstown	146	20	95
Komgha	47	5	7
Maraisburg	60	668	13,321
Middelburg	33	55	3,148
Peddie	10	6	332
Queenstown	48	43	12,537
Sterkstroom	46	100	12,852
Stutterheim	14	—	12,852
Tarka	51	149	18,088
Willowmore	29	1	51,427
TOTALS	623	1,496	172,537

This survey entailed the visiting of 2,869 farms on which it was found that 21,020 morgen were severely infested and 342,901 morgen lightly infested.

The Maturing Potato Crop.— *Continued from page 299.*

to a row of trees. The heaps may be made directly on top of the soil, or in a shallow 6-inch deep trench 2 to 3 feet wide. The length of the heap will depend on the amount of potatoes to be stored. A 6-inch deep trench 2 feet wide when heaped up in triangular shape should hold approximately 500 lb. of tubers per yard. After pitting, the tubers should be covered with a 6-inch layer of straw or straw bundles. An additional thin layer of soil on top of the straw will provide further protection. The heaps should be examined periodically, especially when the weather warms up, in order to guard against possible heating, rotting and sprouting.

Precautions in the Use of Karroo-manure.

Dr. J. I. de Villiers, Research Horticulturist, Subtropical Horticultural Research Station, Nelspruit.

KARROO manure, which consists of the droppings and absorbed urine of sheep or cattle and contains very little litter and impurities other than soil, is being used fairly widely in intensive farming areas to-day because of its low price and the reduced railage rates on manures and fertilizers, as well as the scarcity and increased cost of fertilizers. While many farmers have obtained good results from applications of this manure, others have harmed the crops as well as the soil. This is due to the presence of certain undesirable ingredients which are often entirely ignored or insufficiently taken into account when this manure is used.

Composition of Manures from Three Different Areas.

Table I* gives the average composition of kraal manure from the western Cape Province, the Transvaal, and the Karroo.

TABLE I.—*Composition of 3 Types of Kraalmanure in Percentages.*

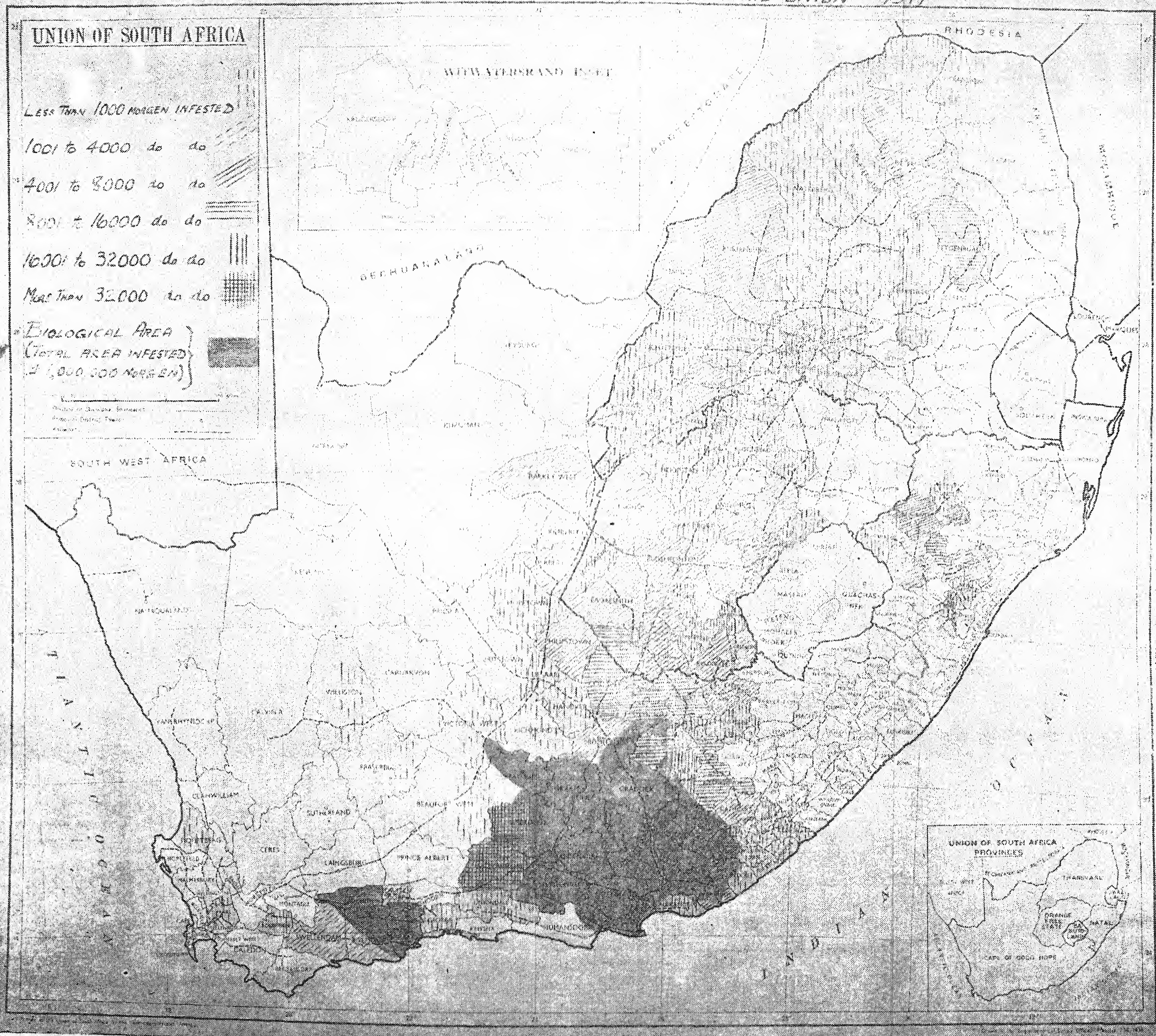
Origin.	Western Cape Province.		Transvaal.		Karroo.	
Basis.	Wet.	Dry.	Wet.	Dry.	Wet.	Dry.
Moisture..............	66·6 to 50·0	—	30·0	—	15·0	—
Organic matter........	18·53 to 27·79	55·58	37·10	53·0	45·0	53·0
Total nitrogen.........	0·73 to 1·10	2·20	1·16	1·66	1·50	1·97
Total potassium as K_2O	1·05 to 1·58	3·16	2·26	3·24	3·50	4·12
Total phosphorus as P_2O_5	0·30 to 0·45	0·90	0·50	0·70	0·60	0·70
Number of samples Analysed.	12		1	2	2	4

Table I shows that in the undried state Karroo manure contains more nitrogen, potassium and phosphoric compounds than does an equal weight of manure from either the summer or the winter rainfall area. However, since manure is usually handled on a volume basis, and since the volume is little affected by its moisture content, the composition, as determined on the dry basis, is a more reliable criterion of its value. The figures in Table I show that Karroo manure is a little richer in nutrients than Transvaal kraal manure but no richer than that from the western Cape Province.

Apart from these desirable ingredients Karroo manure unfortunately also contains undesirably large quantities of a number of

* Figures taken from I. de V. Malherbe's " Grondvrugbaarheid ".

THE SPREAD OF PRICKLY PEAR IN THE UNION — 1941



water-soluble salts, especially the carbonates, chlorides and sulphates of sodium and potassium. When present in sufficient quantities sodium salts cause brak conditions and have a deleterious effect on both the chemical and the physical properties of the soil. Table II gives some of the water-soluble constituents of two samples of Karroo manure.*

Table II.—*Some Water-soluble Constituents of Two Samples of Karroo Manure in Percentages.*

Sample.	1	2
Potassium expressed as K_2O	3·3	2·7
Sodium expressed as Na_2O	1·8	0·7
Ammonium nitrogen	0·2	0·0
Chlorides	1·5	1·5
Sulphates	0·7	0·6
Carbonates	2·8	0·3
Nitrates	0·4	1·0
Reaction expressed as pH	9·8	9·1

Calcium and magnesium were absent in the water extract.

These figures show that apart from nutrient materials like potash, ammonia, nitrate and sulphate there are also considerable quantities of chlorides and carbonates of sodium and potassium, and that there is a marked difference in the soluble carbonate content of the two samples.

Effects of Sodium and Potassium Salts.

When sodium and potassium salts dissolve in the soil solution, the sodium and potassium replace adsorbed cations such as calcium, magnesium and hydrogen.

Adsorbed potassium does not affect soil structure markedly, but tends to give a good structure; at the same time, it is one of the most important nutrient elements in a quantitative sense. Sodium, on the other hand, is not recognized as an essential nutrient element and has a very deleterious effect on soil structure, deflocculating the fine mineral and humus particles and in this way breaking down the soil aggregates. When this happens, the soil is compact when dry and sticky when wet, it absorbs water with difficulty and obstructs the passage of drainage water, and it is poorly aerated and hard to cultivate. To make matters worse, a compartively small amount of sodium can emcompass this undesirable change.

The form in which the sodium and potassium, especially the sodium, are introduced is also of importance. Brought in as sulphates they are least harmful, and in moderate quantities potassium sulphate is likely to be beneficial because of its nutritive value. As chlorides they are more harmful, and as carbonates very much more so. Soluble carbonates hydrolyze with water to form hydroxides which strongly tend to, and in many cases do, make the soil reaction alkaline. An alkaline reaction is undesirable: it renders a number of elements less

* Figures supplied by Division of Chemical Services.

available to plants, and when it reaches a pH of about 8·5, it interferes with the absorption of elements and water, presumably by injuring the semi-permeable membranes in root tissues. The water absorption of plants is also affected by the introduction of soluble salts since the latter create osmotic pressure, a force that acts in opposition to the identical force by which plants absorb water.

The Amount of Salts that May be Introduced.

The quantity of salt that can be brought into a soil before it will harm the plant growth or the soil properties, or both, depends on the following factors:—

(1) *The Nature of the Salts.*—The salts of Karroo manure likely to have a harmful effect have already been discussed. It should be noted, however, that sample 1 in Table II contains almost 10 times as much soluble carbonate as sample 2.

(2) *Water and Drainage.*—Heavy rainfall and irrigation coupled with good drainage at first prevent salts from accumulating to any extent, but these factors cannot prevent the gradual replacement of adsorbed calcium and magnesium by sodium, with the resultant deterioration in structure. As the process continues, drainage, especially on heavier soils, becomes poorer, and salt accumulation results.

(3) *The Physical and Chemical Nature of the Soil.*—Very sandy soils have practically no structure which can be destroyed, and larger quantities of Karroo manure than are recommended in this article may be added provided the soluble constituents are washed down into the deep subsoil before crops are planted. Whether heavy applications will be economical is open to argument, however, and as far as the writer knows this question has not yet been investigated. While the manure is decomposing, the liberation of carbon dioxide will no doubt benefit most plant species, and the partially decomposed material will improve the physical properties of the soil. However, when it becomes further decomposed, the humus which is formed will be in a deflocculated condition owing to the presence of an abundance of sodium and may have a sufficiently adverse effect on the growth conditions to counterbalance the advantages mentioned above.

On sandy loams Karroo manure must pe applied judiciously. Plots on this type of soil which have had a few years' liberal application of Karroo manure often show the breaking up of their aggregates by the formation of a hard crust on the surface. Of the heavier soils, those which have the ability to adsorb great quantities of cations and have large amounts of calcium and magnesium already adsorbed, not to mention those which have calcium and magnesium carbonate in reserve, are much more resistant to the destruction of their structure than are soils which have a relatively small adsorption capacity. One may, with impunity, use larger quantities of Karroo manure (or moderate quantities over a longer period) on the former types of

soil than on soils which have a smaller absorption capacity and contain little adsorbed calcium and magnesium. On these latter soils Karroo manure must be used sparingly.

It must be understood, however, that no chemical treatment or soil property can prevent the accumulation of salts. If drainage is bad for reasons other than structure or texture, or if there is insufficient water to wash the salts into the deep subsoil, the introduction of these brak-producing sodium salts in large amounts must have harmful effects, no matter how good the soil is structurally, mechanically, and chemically.

Precuations Necessary when Karroo Manure is Used.

Because of its high content of harmful ingredients and because the removal of the brak conditions which it tends to create is a slow and costly business, Karroo manure is far from ideal. However, as manure from the summer and winter rainfall areas is often not obtainable in sufficient quantities, as inorganic fertilizers are difficult to procure owing to war conditions, and as some crops respond better to manure or manure plus inorganic fertilizers then to inorganic fertilizers alone, Karroo manure must be used in many cases. In its application the following precautions must, therefore, be taken:—

(1) Apply the manure in very moderate amounts. A single application of 60 tons of Karroo manure per morgen, even if followed by a heavy irrigation of 5 inches is likely to leave sufficient soluble salts in the first foot of soil to endanger plant growth. Twenty tons per morgen must be considered the maximum application per year, and if the Karroo manure contains one per cent. or more of soluble carbonates (see paragraphs 3 and 4 below) it is advisable to reduce this application to 10 tons or less per morgen.

(2) Broadcast and incorporate the manure with the soil at least a month before the crop is planted and follow it with at least one heavy irrigation of about 5 inches. If the slope of the land makes such heavy irrigations impracticable, give two 3-inch irrigations at a few days' interval. Heavy rains during this period will, of course, affect the amount of irrigation required. The object is to wet the soil and thus spread the salts to a depth of not less than 5 feet. The finer the manure is the better. If it is coarse and lumpy, the lumps should be broken up as small as possible. Unless the manure is well broken up, it must be applied still earlier with some irrigations before planting. planting.

(3) If the manure is used for crops that respond to superphosphate, the latter should be mixed and applied together with the manure. The calcium phosphates, in the superphosphate, which are soluble in the soil solution react with the carbonates in the manure to form beneficial calcium carbonate(agricultural lime). Superphosphate also contains 30 to 40 per cent. gypsum (calcium sulphate) which reacts with carbonates to form calcium carbonate and the less harmful sulphates of sodium and potassium.

These reactions are important, but in practice it is not economical to bring in sufficient superphosphate to take care of all the soluble carbonate in the Karroo manure. The remaining carbonate may be neutralized by mixing powdered gypsum with the manure, the quantity of gypsum depending on the amount of Karroo manure applied, its content of carbonates, and the amount of superphosphate added.

To offset the harmful effects of the injurious soluble carbonates contained in 10 tons of Karroo manure of the composition of sample 1 in Table II, 1,700 lb. of gypsum will be required. An application of 400 lb. of superphosphate containing 40 per cent. mono-calcium phosphate and 40 per cent. gypsum supplies the equivalent of 280 lb. of gypsum. Thus to neutralize all the remaining carbonates, the addition of a further 1,400 lb. of gypsum is necessary.

If 10 tons of Karroo manure of the composition of sample 2 in Table II were used, no gypsum would be required over and above the equivalent contained in an application of 250 lb. of superphosphate.

If the manure contained 1 per cent. carbonate, 300 lb. of gypsum would have to be added in addition to 400 lb. of superphosphate per half morgen.

(4) The difference in the composition of different samples of Karroo manure is of importance with regard to its effect on plants and the soil. There is evidence that the amount of water-soluble carbonate depends on the area in the Karroo where the manure originated and probably also on the age of the deposit. The Division of Chemical Services is now investigating this angle of the problem. Until more information is available, however, a chemical determination is the only safe guide as to the water-soluble carbonate content of the manure. If sellers provide analyses of their manure the grower should, of course, choose the manure containing the least sodium and carbonate.

(5) Provision should be made for the introduction of additional organic matter either in the form of green-manure cover crops, such as sunn hemp for example, or as compost. If compost is used, the Karroo manure should preferably be mixed with the material in the pit or heap when the compost is made. If a cover crop is sown in soil which is at all low in calcium, the soil should be fortified with calcium by applying agricultural lime at the time the cover crop is sown. This will help to maintain the required wide calcium: sodium ratio.

If the above recommendations are carried out, Karroo manure may probably be used for years on most soils without detrimental effects. To keep a check on how things are going, it will be advisable, however, to send soil samples to the nearest College of Agriculture or theDivision of Chemical Services, Pretoria, after a few years' applications, so that determinations of the soil reaction and salt content can be made and an opinion obtained on the condition of the soil.

Soybean-meal as a Source of Protein in Poultry Rations.

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IN the past, poultry farmers used mainly animal proteins in their poultry rations, but under present conditions the tendency is to make more extensive use of vegetable protein. The results obtained by feeding vegetable protein in poultry rations in the past were very poor, largely due to the lack of or wrong proportions of minerals such as calcium, phosphorus, sodium and vitamins (especially riboflavin) in vegetable protein such as soybeans and groundnuts. Extensive studies on the feeding of farm animals have proved, however, that soybeans constitute an excellent source of vegetable protein.

At the present time, soybeans are not yet being produced in the Union on a large scale. It is a crop not yet generally known, but it is expected that it will in time become of importance in the agricultural industry. (The cultivation of soybeans is fully discussed in an article by J. J. du Toit in *Farming in South Africa*" of January 1942.)

Soybeans in Poultry Rations.

Since 1940 the Agricultural Research Institute has been conducting experiments with soybeanmeal as a source of proteins in poultry rations. The aim of these experiments was largely to determine the nutritive value of soybeans and to ascertain to what txtent this nutrient can be substituted for protein of animal origin, such as meat- and fishmeal, in poultry rations. The experiment was commenced on 24 September 1940, with 360 day-old White Leghorn chicks which were divided into 8 uniform groups of 45 each. All of these chicks were healthy and free from abnormal characteristics. From the first day they were fed on rations as given in Table I. The feed was always given dry in hoppers to which the chickens had access at all times. In group 4, green feed was substituted for brewer's yeast in order to ascertain to what extent green feed can be used in order to provide riboflavin (the growth-promoting vitamin). Yeast is an important source of this vitamin. The ration fed to group 7 contained 0·15 per cent. cystine, an amino acid which is necessary for normal vital functions and also has an important effect on the metabolism of protein. Soybeanmeal which had been baked at a temperature of 140 to 150 degrees C. for 20 minutes. was used for the experiment. To ensure even baking, the meal should be of uniform fineness.

Overseas, better results were obtained with baked soybeans than with raw beans; this is attributed to the liberation and consequent availability of amino acids of the methionine-cystine complex present in the raw product, which the system, however, is unable to absorb

in adequate quantities. To ensure adequate absorption of the amino acids in soybeans, baking of the beans appears to be essential, when utilized in poultry rations.

TABLE I.—*Rations fed to Chicks from the Age of 1 Day to 8 Weeks.*

Feed.	Group 1	Group 2	Group 3	Group 4	Group 5	Group 6	Group 7	Group 8
	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.
Yellow Mealiemeal....	60	60	60	60	60	60	60	60
Pollard..............	10	10	10	10	10	10	10	10
Wheaten Bran.......	12	12	12	12	12	12	12	12
Oatmeal.............	10	10	10	10	10	10	10	10
Lucerne Meal........	5	5	5	5	5	5	5	5
Brewer's Yeast.......	3%	3%	3%	Green Feed	3%	3%	3%	3%
Meatmeal............	13	10	8·5	8·5	6	—	—	—
Raw Soybeanmeal....	—	11·5	19·0	19·0	27·5	51	51	—
Baked Soybeanmeal..	—	—	—	—	—	—	—	39
Cystine..............	—	—	—	—	—	—	0·15%	—
Bonemeal............	2	2	2	2	2	1½	1½	1½
Powdered Oystershell.	1	1	1	1	1	1½	1½	1½
Salt.................	¾	¾	¾	¾	¾	¾	¾	¾

TABLE II.—*Average Consumption of Feed and Weight per Chick up to the age of 8 Weeks.*

Group.	Weight per Chick, in Grammes.		Consumption of Feed up to 8 Weeks (Grammes).	Percentage of Deaths.
	Male.	Female.		
1................	378	343	1,128	—
2................	311	284	996	2
3................	305	278	919	2
4................	265	250	956	2
5................	288	251	1,051	2
6................	307	271	1,102	2
7................	372	326	1,158	2
8................	415	369	1,280	—

N.B.—28·34 grammes are equal to one ounce in weight.

The average feed consumption and the weight per chick at the age of 8 weeks are given in Table II. From this it will appear that the weights of the chicks at the age of 8 weeks were not exceptionally good. To a large extent this may be attributed to the time of hatching, since chickens hatched late do not grow as rapidly as those of earlier hatchings. In the second place it has been assumed that the meatmeal was not of good quality. Meatmeal containing 80 per cent. protein was used in the experiment. Had it possessed a high biological value, the chicks in group 1 should have weighed considerably more at the age of 8 weeks.

The results may briefly be summarised as follows:—

(*a*) Raw soybean-meal may be substituted for 30 per cent. of the meatmeal in the chicken ration;

(*b*) raw soybean-meal supplemented by cystine is just as effective for the promotion of growth as baked soybean-meal;

(*c*) baked soybean-meal yielded much better results than raw soybean-meal;

(*d*) from the experiment it appeared that green feed may be substituted for brewer's yeast in the ration.

At the age of 8 weeks the males were separated from the females, the latter remaining in the original groups. Up to the age of 20 weeks the pullets, with the exception of group 7, received the same rations as those given in Table 1. In the case of the pullets in group 7, cystine was omitted merely because none was available. After 20 weeks the rations fed were as given in Table 3. For each group the mash plus yellow mealies contained 15 per cent. crude protein. Oystershell and grit were given in separate hoppers.

TABLE III....*Composition of Rations Fed after the Age of 20 Weeks.*

Feed.	Groups.							
	1	2	3	4	5	6	7	8
	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.
Wheaten Bran.......	20	20	20	20	20	20	20	20
Pollard..............	20	20	20	20	20	20	20	20
Yellow Mealiemeal...	40	40	40	40	40	40	40	40
Oatmeal..............	10	10	10	10	10	10	10	10
Lucernemeal.........	5	5	5	5	5	5	5	5
Brewer's Yeast.......	3	3	3	Green Feed	3	3	3	3
Meat- and Bonemeal..	20	14	10	11	7	—	—	—
Bonemeal............	$2\frac{1}{4}$	$3\frac{1}{2}$	$4\frac{1}{4}$	$4\frac{1}{4}$	$4\frac{3}{4}$	6	6	6
Powdered Oystershell.	$1\frac{1}{4}$	$1\frac{1}{4}$	$1\frac{1}{4}$	$1\frac{1}{4}$	$1\frac{1}{2}$	$1\frac{1}{2}$	$1\frac{1}{2}$	$1\frac{1}{2}$
Raw Soybean Meal...	—	14	22	24	30	44	44	—
Baked Soybean Meal.	—	—	—	—	—	—	—	35
Fine Salt...........	1	1	1	1	1	1	1	1

By means of trap nests, complete records were kept of the number of days to sexual maturity, weight of hen on attaining sexual maturity and the weight of individual eggs produced. By the term sexual maturity must be understood the number of days elapsed from the date of hatching until the pullet lays her first egg. Up to 31 August 1941, the particulars in respect of egg production, body weight, egg weight and consumption were as given in Table 4. The consumption of feed per hen includes the quantity of feed consumed from 24 September 1940, to 31 August 1941, i.e. a period of 342 days. The egg production per hen was determined from the date on which the pullet laid her first egg up to 31 August.

A brief summary of the results follows:

TABLE IV.—*Production, Sexual Maturity, Body Weight and Egg Weight of Pullets in Soybean Experiments.*

Group.	Number of Pullets.	Quantity of Feed Consumed per Hen.	Number of Days to Sexual Maturity.	Body-weight on Laying First Egg.	Weight of First Ten Eggs.	Average Production per Hen.	Average Weight of Eggs.	Number of Pullets which Died.
		Grammes.		Grammes.	Grammes.		Grammes.	
1	21	26,694	201·5	1,746·3	498·3	83·48	56·63	3
2	25	25,244	194·04	1,670·5	475·8	71·32	54·3	—
3	23	24,637	225·4	1,638·5	491·8	58·33	54·53	1
4	17	25,761	224	1,639·1	518·1	67·41	55·3	3
5	20	22,935	226	15,40·1	500·8	48·15	54·5	1
6	18	21,568	237·2	1,591·3	542·3	34·8	56·2	1
7	21	22,613	218	1,714	517·5	48·4	54·0	—
8	17	27,489	188·2	1,610·5	474·5	75·65	53·3	2

(1) The pullets fed on rations 1, 2 and 8 commenced laying at an earlier age than those fed on rations 3, 4, 5, 6, and 7.

(2) The meatmeal group, No. 1, yielded heavier weights on the attainment of sexual maturity than the other groups.

(3) The first 10 eggs of pullets of late sexual maturity (groups 4, 5, 6, and 7) weighed more than those of pullets of early sexual maturity (groups 1, 2, and 8);

(4) The pullets in groups 1, 2, 4, and 8 laid the largest number of eggs;

(5) The pullets in group 8, which received baked soybean-meal, laid almost as many eggs as those in group I which received meatmeal.

The Second Experiment.

In a second experiment, use was made of 4 groups of 32 White Leghorns each, hatched and reared on the experiment farm of the Institute. This group was treated according to the semi- intensive system, i.e. they were kept in a house having an enclosure in front. The ages of the pullets varied from 10 to 12 months. When dividing the pullets into groups, the date of hatching, body weight and winter production were taken into account.

The mash rations were fed dry in hoppers. With a view to ensuring uniform consumption of feed, no scratch grain was given. Each individual group received 2 lb. of shredded green feed daily. The rations are given in Table V. The mash ration for each group contained 16 per cent. crude protein. Oystershell and grit were given in separate hoppers.

The pullets were weighed at the commencement and again at the conclusion of the experiment which extended from September 1940, to 31 January 1941. By using trap nests, individual egg records were kept. Eggs were weighed during the first two months

of the experiment and again during the last 10 days. At the beginning the pullets were allowed 14 days in order to become accustomed to the new conditions and rations.

The results are given in Table 6.

TABLE V.—*Rations for Pullets.*

Feed.	Groups of Pullets.			
	1	2	3	4
	lb.	lb.	lb.	lb.
Wheaten Bran	20	20	20	20
Pollard	20	20	20	20
Yellow Mealiemeal	40	40	40	40
Oatmeal	10	10	10	10
Lucerne Meal	5	5	5	5
Meatmeal and Bonemeal	8·75	6·5	3·5	—
Raw Soybean-meal	—	5·0	11	18
Bonemeal	1½	2¼	3½	4¾
Powdered Oystershell	1½	1¾	2	2½
Fine Salt	1%	1%	1%	1%
Green Feed Daily	2	2	2	2

TABLE VI—*Summary of Results, and General Data.*

	Groups of Pullets.			
	1	2	3	4
Number of Pullets: At Commencement	32	32	32	32
Percentage Mortality	15·8	15·8	15·8	14·37
Average Consumption of Feed per Hen, in lb	39	44	44	43
Average Egg Production per Hen	75	92	69	70
Quantity of Mash for the Production of One Dozen Eggs, in lb	6·2	5·8	7·5	7·34
Average Weight of Eggs, in Ounces at Beginning of Period	2⅛	2⅛	2·0	2¹/₁₆
Average Weight of Eggs, in Ounces, at End of Experiment	2¹/₁₆	2⅛	1⅞	2
Average Body Weight in lb. at Beginning of Experiment	4⅜	4⅛	4³/₁₆	4⁵/₁₆
Average Body Weight, in lb., at End of Experiment	4⅛	4	3⅝	3⁹/₁₆

In October 1941, the pullets in the various groups became severely infested with round worms. In order to combat this infestation, tobacco (sheep lick) having a nicotine content of from 1·7 to 2 per cent. in the proportion of 4 lb. to every 100 lb. of feed, was mixed into the feed. In addition, 1 lb. of sugar cane molasses to 1 gallon of water was supplied twice a week in the drinking water. In a few individual cases as many as 23 large round worms were found in the excreta at a time.

It must be clearly understood that no claim is made that the above treatment will prove fatal to the worms. There are definite

proofs to show that small round worms are capable of building up a resistance against nicotine. In this instance it was intended to maintain and build up the resistance of the birds—not so much to destroy the worms.

In addition to this infestation, the pullets in all groups were subject to colds, which may possibly be the reason for the decrease in egg-production during October. As a result of the treatment with tobacco and sugar cane molasses, the pullets regained their vitality within a fortnight.

For the information of farmers, it may be pointed out that 4 per cent. of tobacco in the feed and 10 per cent. of sugar cane molasses in the drinking water will probably be too high a proportion to be fed continuously. Better results will be obtained by carrying out this treatment for a week at a time only and then leaving off again. On the Experiment Farm only 2 per cent. of tobacco is mixed with the mash fed to the birds for the control of worms. Sugar cane molasses is added to the drinking water on Tuesdays and Saturdays. The quantity of molasses added, amounts to 5 per cent., i.e., approximately an ordinary cupful to a gallon of drinking water. It is unnecessary to feed tobacco throughout the year since birds are most subject to worm infestation during the rainy period, when the weather is warm as well. During that time tobacco need only be fed during the first fortnight in each month.

The results of the second experiment may briefly be summarized as follows:

(1) In a ration for laying hens, 6·5 lb. of meatmeal and 5 lb. of raw soybean-meal may be substituted for 8·75 lb. of meatmeal; 5 lb. of raw soybean-meal is, therefore, approximately equal to $2\frac{1}{4}$ lb. of meatmeal.

(2) The feeding of 3·5 lb. of meatmeal and 11 lb. of soybean-meal results in a decrease in egg production; consequently a larger quantity of feed per hen is required to produce a dozen eggs.

In this experiment the feeding of raw soybean-meal did not affect the weight of the eggs adversely. From the second last column of Table 4 it will be noticed that all those groups of hens which received raw and baked soybean-meal, with the exception of group 6, laid smaller eggs than the meatmeal group, namely, group 1. The factors affecting the weight of eggs are numerous, consequently no definite conclusion can be drawn with regard to the difference in the weights of eggs before further experiments covering a longer period have been conducted.

Raw Soybeans Omitted.

In a third experiment varying percentages of baked soybean-meal and white fishmeal were fed to chickens. Raw soybean-meal was omitted in this experiment, since previous experiments had shown that raw soybean-meal cannot be substituted for more than one-third of the quantity of meatmeal in chicken and laying rations.

In the experiments carried out by Wilgus and collaborators, 1941, raw soybean-meal and casein as the only sources of proteins were fed to separate groups of chickens. The experiment extended over a period of six weeks. After a careful examination it was found that the thyroid gland of chicks which had received raw

soybean-meal was approximately six times as large as in the case of those chicks which had received casein. Where raw soybean-meal was supplemented by iodine, the thyroid gland developed to the normal size. These results indicate that raw soybean-meal has a deficiency of iodine; consequently chicks fed on large quantities of raw soybean-meal in a ration having a low iodine content, may contract a form of goitre.

Since white fishmeal is a good source of protein as well as iodine, it was thought advisable to feed this together with baked soybean-meal.

The Third Experiment.

The White Leghorn chicks used for the third experiment were hatched on 7 October 1941. Those chicks which were strong and healthy were divided into 8 uniform groups of 44 each, and reared in the same house as those of the first experiment. Every second week the weight to the nearest gramme of each individual chick was obtained. The rations are given in Table VII. The chicks in groups 5, 6, 7 and 8 daily received adequate quantities of finely cut green feed. The results are given in Tables VII, VIII, IX and X.

TABLE VII.—*Baked Soybean-meal and Fishmeal in the Feed of Chicks up to the Age of* 8 *Weeks.*

Feed.	Groups.							
	1	2	3	4	5	6	7	8
	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.
Yellow Mealiemeal	60	60	60	60	60	60	60	60
Pollard	10	10	10	10	10	10	10	10
Wheaton Bran	12	12	12	12	12	12	12	12
Oatmeal	10	10	10	10	10	10	10	10
Lucerne Meal	5	5	5	5	8	8	8	8
Brewer's Yeast	3	3	3	3		Green	Feed.	
Fishmeal	15	10	6	—	17	12	7	—
Baked Soybean-meal	—	11	18	30	—	11	22	37
Bonemeal	1	2	3	4	1	2	3	3
Powdered Oystershell	1¾	2	1¾	1¼	1½	1½	1½	2½
Fine Salt	—	½	¾	1	—	½	¾	1
Manganese Sulphate, in Grammes	7	7	7	7	7	7	7	7

TABLE VIII.—*Analysis of Rations.*

	Groups.							
	1	2	3	4	5	6	7	8
Crude Protein	19·31	19·31	19·32	19·24	19·35	19·34	19·33	19·26
Calcium	1·87	1·85	1·82	1·8	1·81	1·79	1·78	1·81
Phosphorus	0·93	0·88	0·92	0·91	0·94	0·92	0·91	0·95

TABLE IX.—*Consumption of Feed, in grammes, per Chick ranging from One Day to 8 Weeks Old, and Number of Deaths.*

	Groups.							
	1	2	3	4	5	6	7	8
Feed Consumption in Grammes..........	1,585·5	1,676·1	1,268·4	1,177·8	1,245·75	1,214·1	1,186·9	1,131·6
Number of Chicks at Commence of Experiment..............	44	44	44	44	44	44	44	44
Number of Deaths...	1	5	5	4	5	5	10	8

TABLE X.—*Average Weight per Chick—in grammes—at the Age of 8 Weeks.*

	Groups.							
	1	2	3	4	5	6	7	8
Weight: Cockerel....	649·0	657·4	533·7	357·6	518·5	475	390·7	339·7
Weight: Pullet......	546·2	532·3	466	345	420	409·3	356·6	311·1
Number of Cockerels Eight Weeks Old..	19	21	16	20	23	14	15	13
Number of Pullets Eight Weeks Old...	24	18	23	20	16	25	19	23

It will be noticed that salt was not included in the rations for groups 1 and 5. Included in a ration as the sole source of concentrated protein, fishmeal has a sodium content which is adequate.

Conclusions.

In so far as results are concerned, we come to the following conclusions:—

(1) A ration which contains 10 lb. of fishmeal and 11 lb. of baked soybean-meal is just as effective for the normal growth of chicks as a ration containing 15 lb. of fishmeal. Fishmeal contains 65 per cent. of protein, and baked soybean-meal 40 per cent. Approximately 11 lb. of baked soybean-meal may, therefore, be substituted for 5 lb. of fishmeal.

(2) When 6 lb. of fishmeal and 18 lb. of baked soybean-meal are fed to the chicks as sources of concentrated protein, growth is retarded.

(3) Both fishmeal and baked soybean-meal have a low riboflavin content.

(4) Green feed cannot be substituted for brewer's yeast as a source of riboflavin in chick rations.

In the case of the first experiment with chicks, the writers stated that green feed could be substituted for brewer's yeast as a source of riboflavin. The conclusions drawn from the first experi-

ment are, therefore, contradictory to the results of the third experiment. In the first experiment the chicks receiving superior rations did not grow as rapidly as those receiving superior rations in the third experiment. It has also been pointed out that the meatmeal, although it had a high protein content, was of poor quality. The results indicate that the fishmeal was of very good quality. To illustrate the contrast, examples may be taken from groups which received fishmeal together with baked soybeans. (Table X.)

When the cockerels from group 4 are compared with those from group 8, the difference is in favour of group 4, but these differences are not significant. Both groups received only baked soybean-meal in the control ration. Nor is the difference between the pullets significant. Both groups of cockerels and pullets showed poor growth. In this case, the weights of chicks in group 4, which received brewer's yeast, did not greatly exceed the weights in group 8, which received green feed. It has also been mentioned that, in order to be effective, 11 lb. of baked soybean-meal can be substituted for only 5 lb. of fishmeal. In the two groups mentioned, it is, therefore, more probable that the protein, rather than the yeast or green feed, was responsible for the poor weights.

When groups 1 and 5 are compared, the differences are found to be highly significant. Both groups received only fishmeal in addition to the control ration. Group 1 received 3 per cent. of brewer's yeast, while group 5 received green feed. Group 1 showed much better growth than group 5. In this case the protein was of much better quality than that fed to groups 4 and 8. The great difference in weight between groups 1 and 5 may, therefore, be attributed to the difference of the riboflavin in the feed.

Consequently, when chicks are fed on two rations with the same protein content, the protein, however, being of poor quality, their growth will be slow and only a slight difference in weight will result where one group receives brewer's yeast and the other green feed. Should two rations with the same protein content and protein of good quality be fed, however, the weights of the chicks in the group which receives brewer's yeast will greatly exceed those of the chicks in the green-feed group. Since groups 1 and 2 showed much better growth than any of the other groups. the final conclusion arrived at is that green feed cannot be substituted for brewer's yeast as a source of riboflavin for the normal growth of chicks.

Mortality can be regarded as normal except in groups 7 and 8. In the above-mentioned two groups the majority of the chicks died from dermatitis. Two chicks also died from dermatitis in each one of groups 5 and 6. No dermatitis occurred in the first four groups which received 3 per cent. brewer's yeast. Dermatitis is caused by a deficiency of the filtrate factor which also belongs to the vitamin B 2-complex. The disease is characterized by sores at the corners of the beak, and swelling of the eyelids which stick together, thus hampering the chick's sight to such an extent that it cannot see to eat. The disease mostly attacks chicks between the ages of 3 and 4 weeks. The feathers become ragged in appearence and growth is retarded. Those chicks which recover, grow so slowly that in most cases it proves unprofitable to keep them.

From an experiment in which 4 groups, of 50 White Leghorn chicks each, were fed on varying percentages of soybeanhay-meal it appeared that soybeanhay-meal cannot be substituted for lucerne meal in chick rations.

[*Continued on page* 336.

Vitamin C Content of Guavas.

W. W. Boyes and D. J. R. de Villiers, Low Temperature Research Laboratory.

I. The Occurrence of Vitamin C in Guavas.

VITAMIN C, the antiscorbutic vitamin, plays an important rôle in human nutrition and the Department of Defence has therefore included considerable quantities of concentrated orange juice and canned guavas in the diet of troops in regions where fresh fruit and vegetables are unobtainable.

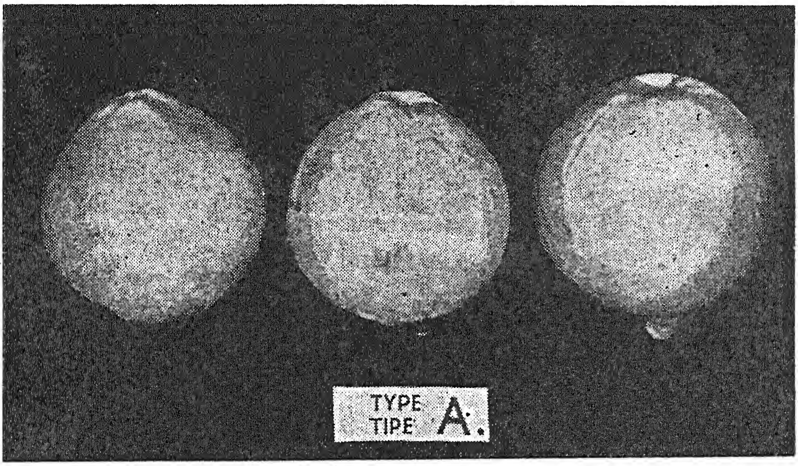


Fig. 1.—*Type A:* Small, round guava. The outer flesh is very thin and readily parts from the inner flesh. The Madeira guava is of this type. The flesh is salmon to brick in colour. It is an early-season variety.

Although possessing an extremely high vitamin C content, concentrated orange juice suffers from the inherent disadvantage that it loses its potency and is subject to decomposition and spoilage during storage at high tropical temperatures.

In view of the fact that, early in 1939, investigations made in the Low Temperature Research Laboratory revealed an extraordinarily high vitamin C content in the fresh guava, attention was directed to this fruit as a possible source of vitamin C. It soon became clear that canned guavas would form a relatively cheap and palatable natural source of this vitamin, which would at the same time be extremely potent and stable under all adverse tropical conditions.

Fortunately, the canned guava is a local product, and in view of the importance of these findings the Laboratory has devoted a fair amount of attention to this fruit.

It should be noted that this is not the first Laboratory to have determined the ascorbic acid content of South African guavas. For instance, Fox and Levy* in a general survey of South African fruit

* F. W. Fox & L. F. Levy (1936), Biochem. Jour. 30, 1, 208.

in Johannesburg in 1936 found values ranging between 56 and 89 mgs. per 100 gms. for guavas. The present investigations, however, have yielded values over 600 mgs. per 100 gms., i.e., of the order ten times as high as for fresh orange juice, which is generally recognized as a very rich source of this vitamin. And, what is even more important, the tests have indicated a very remarkable stability of the vitamin C in canned guavas. The lower readings found in Johannesburg as compared with those found in Cape Town are probably due to differences in type.

Method of Extraction.

Each sample comprised at least a dozen guavas, all pips being removed prior to extraction. Ten grams of the minced mixture were ground in a mortar with the aid of chemically pure fine sand, 10 c.c. of 5 per cent. metaphosphoric acid being added. The pulp was then washed into a centrifuge tube with a further 10 c.c. of 5 per cent. metaphosphoric acid. After centrifuging for 5 minutes, the clear solution was poured off into a 100 cc. measuring flask. A further 15 c.c. of 2 per cent. metaphosphoric acid was added to the tube and the material again centrifuged. This washing was repeated until all the ascoboric acid was washed out. The 100 c.c. flask was then made up to the mark with distilled water, retaining a strength of approximately 2 per cent. metaphosphoric acid. Of this extract 2 c.c. was then titrated against a solution of 2-6 dichlorophenolindophenol dye as recommended by Tillman, Hirsh and Hirsh.*

It may be stated that in a few samples the ascorbic acid content was also determined by titrating against $N/100\ I_2$ solution and that the results obtained were always very close to those determined by the above method (see Table 1); the determinations could, in fact, have been made by direct titration against $N/100\ I_2$.†

TABLE I.—*Iodine* vs. *Dye method.*

Sample.	Mgms. Vitamin C per 100 gms. guava pulp.	
	Dye method.	Iodine method.
1	458	455
2	482	480
3	445	443
4	443	440

Standardization of Indicator.

Standardization of the 2-6 dichlorophenolindophenol indicator against lemon juice, the vitamin C content of which had previously been measured by $N/100\ I_2$ proved unsatisfactory as the results varied appreciably; and subsequently the standardization was effected by

* Described in the Vitamin C content of S.A. Oranges, P. J. Hamersma, D.O.A. & F., South Africa, Sci. Bull. 163, 9.

† Those interested in the results of the furfural method used as a check are referred to a paper by W. E. Isaacs: "A comparison of the Ascorbic Acid Content of the Guava determined as Furfural and by Indophenol Titration", obtainable from the Superintendent, Low Temperature Research Laboratory, Cape Town.

direct titration against known strengths of chemically pure ascorbic acid, new dye solutions being made up at four-day intervals.

The present method strictly measured indophenol reducing power as distinct from vitamin C and has been checked in this Laboratory by a completely different method, which is not dependent on reducing power.

The laboratory has no facilities for making biological assays, but it should be recorded that the South African Institute for Medical Research has now conducted biological assays in regard to the determination of actual vitamin C. In an approximate biological check

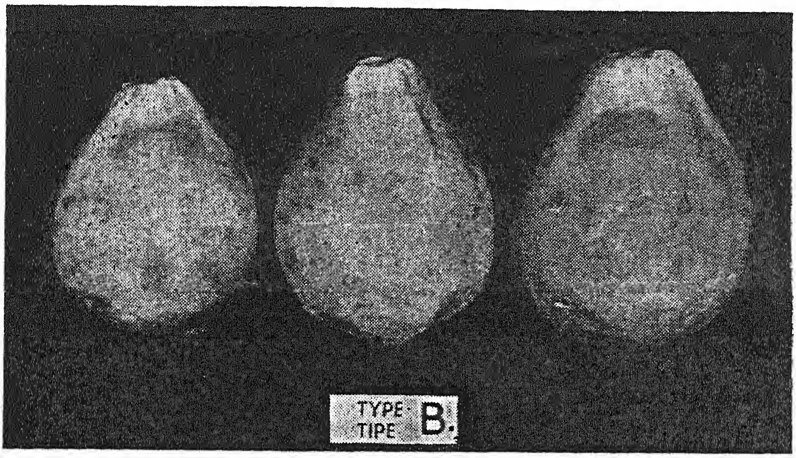


Fig. 2.—*Type B:* Pear-shaped guava with relatively more outer flesh than Type A. The flesh is almost salmon to yellow in colour. It is an early to mid-season variety.

of the indophenol dye reducing power for canned guavas, Dr. Goldberg‡ of that Institute found that the biological values were almost as great as those indicated by the chemical assays.

Types of Guavas found in the Western Cape Province.

The guava has hitherto enjoyed little attention in South Africa and this may account for the fact that no general nomenclature exists for this fruit. Many futile enquiries have been directed to growers, nurserymen and horticulturists regarding guava varieties grown in this country. It is no exaggeration to state that in the same orchard may be found as many as ten different types: some early, others late, some white fleshed, others pink or salmon fleshed, some round and others pear-shaped. This mixture seems to be due to the fact that most nurserymen propagate guavas by means of seeds. According to guava growers the seeds from any one guava may give different types and vegetative propagation is the only way of ensuring uniform types. A number of farmers have adopted the latter course.

The Madeira, an early season guava, of poor quality, is found to some extent in the western Cape Province whilst, judging from samples obtained in the Transvaal, it appears to be the predominant type in that Province. This type of guava is not very popular with canners, as it has very little outer flesh, having a large amount of

‡ Nature, Sept. 6. 1941, 148, 3749, 286.

inner flesh and pips. This type is at its peak from about April to June. Another type which is very common in the western Cape Province is the "Retief Baster", which has generally been propagated vegetatively. This is a mid-season to late variety (July to October) and is very popular amongst canners. The flesh remains firm after canning and the outer and inner flesh do not part readily.

Late in the season, August to November, another type of fruit ripens which is almost oval in shape. This type has very few pips and consists mostly of outer flesh. When ripe, it has a bright pink flesh similar to a ripe watermelon.

On visiting several of the larger orchards of the western Cape Province, five distinct types of guavas were collected and marked types A, B, C, D, E. These types represent only a few of the more common guavas.

Vitamin C Content of Various Types of Guavas.

The five main types of guavas were collected from two orchards in the Paarl district (Farms X and Y). The fruits were picked by the farmers at the stage of ripeness at which they are normally picked for canning, and were sorted in the Laboratory into the various types. Before the analysis was made the outer flesh (plus skin) and the inner flesh as well as the pips were separated and the proportions noted. The pips were washed clean of flesh and allowed to dry at room temperature. The two portions of flesh were then minced together and the vitamin C content measured.

The average vitamin C contents for these types as well as the percentage of outer flesh, inner flesh and pips of the various types were determined over a period of three months, some of these figures being averages of over twenty readings made at different times.

TABLE II.—*Vitamin C and Types of Guava.*

Type of Guava (flesh).	Percentage Outer flesh (min.–max.).	Percentage Inner flesh (min.–max.).	Percentage Pips (min.–max.).	Mgms. Vit. C 100 gms (min.–max.).
A. (Salmon)....	61·0 (59–64)	34·3 (31–36)	4·7 (3·5–5·8)	227·3 (172–283)
B. (Salmon)....	71·5 (67–75)	24·9 (22–28)	3·6 (3·1–4·8)	267·0 (264–295)
C. (White).....	67·7 (67 73)	28·3 (27–31)	4·0 (3·3–4·7)	359·8 (284–435)
C. (Orange)....	69·2 (67–70)	26·6 (26–29)	4·2 (4·0–4·3)	220·6 (206–234)
D. (Pink)......	72·0 (68–79)	25·2 (18–29)	2·7 (1·7–3·2)	561·5 (484–633)
E. (Deep pink)	79·3 (78–86)	17·2 (14–22)	2·3 (1·2–2·7)	550·2 (481–671)

Table II clearly indicates that there is *a great dissimilarity between the vitamin C content of the different types.* It may be interesting to note at this stage that a sample of freshly canned early season Madeira quavas contain only 490·0 mgs. vitamin C per can, whilst later in the year a sample of freshly canned guavas of types D and E was found to contain as much as 2527·0 mgs. vitamin C per can! These cans were all identical in size and had been subjected to the same treatment so that the difference could have been due only to the original vitamin C contents of the fresh guavas. The difference between types A and D shown in Table II would probably have been greater if these investigations had been

commenced earlier in the season. Only the last fruits of the crop of the Madeira type were tested and later season pickings generally have a much higher vitamin C content than the earlier pickings.

There appears to be some correlation between the colour of the flesh and the vitamin C content. Types with the salmon coloured flesh generally have a much lower vitamin C content than somewhat similar pink-fleshed types. Type B, for instance, broadly resembles type D in appearance, yet it has a very much lower vitamin C content.

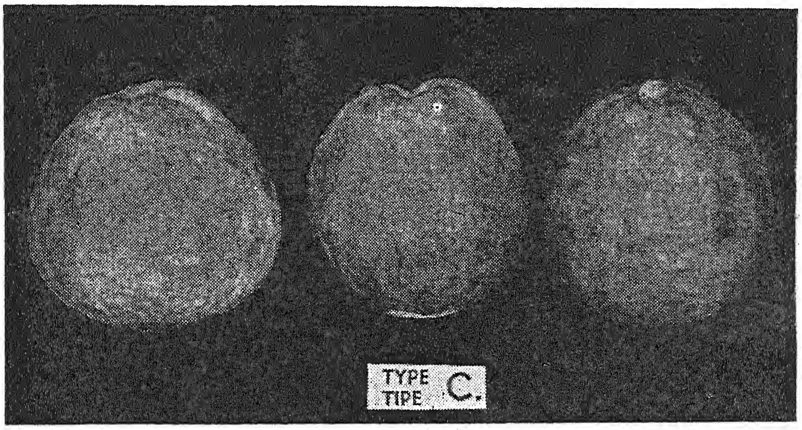


Fig. 3.—*Type C:* This is the large mid-season type. It is round, with a coarse knobbly skin. The flesh is usually white but the fruit is also found with a light orange colour. This type is not very popular with canners as it is very readily bruised. It is a good guava for eating in the fresh state, with a very distinct guava flavour and a large proportion of outer flesh.

There also appears to be some correlation between the percentage of outter flesh and the vitamin C content. This is understandable as most of the vitamin C is found in the outer flesh.

It has also been generally found that *the fewer the pips the higher the vitamin C content.*

Vitamin C Content of Guavas from Different Districts.

It is a very difficult matter to draw a comparison between guavas from various districts. In regard to picking time it may be interesting to cite the two farms in the Paarl district, from which most of the samples for the present tests were obtained, one very near the mountains (Farm X) and the other in the valley (Farm Y). These farms were not more than five miles apart, yet the same type of guava grown in the valley was at least two months more advanced than that grown near the mountain.

Guavas grown in the Transvaal seem to be at least eight months ahead of those grown in the western Cape Province. Unfortunately these investigations were started too late and only one sample at the end of the guava season could be obtained from the Transvaal. This sample corresponded to type A. For comparison, a sample was obtained from the eastern Cape Province (shape corresponding to Type A but white fleshed) and from the Malmesbury district corresponding to the Madeira type).

TABLE III.—*Guavas from Different Localities.*

District.	Type.	Mgms. Vit. C 100 gms. fruit.
Eastern Cape Province.............	A. White fleshed..........	104·5
Transvaal..........................	A. Salmon fleshed........	254·4
Malmesbury.........................	A. Salmon pink..........	139·0
Paarl. Farm X*	All types..................	362·6
Paarl. Farm Y†	All types..................	435·6

* Average of 20 samples, including all types picked from June to October.
† Average of 25 samples, including all types picked from June to August.

The data shown in Table III merely indicate the differences which can occur, and many more readings are required at different periods, seasons, etc., before any conclusions can be drawn. It may be noted that the present figures given for Farm X include many samples of the Madeira variety which contained well under 200 mgs. vit. C per 100 grams. If a greater proportion of later season guavas had been taken, this figure would have been much higher. This point is of considerable importance as by far the larger portion of the guava crops grown in this area fall under the mid- to late-season types which do not include the Madeira variety. This latter type may, however, be predominant in the Transvaal. It is seen that the types of guavas grown in the western Cape Province generally have a relatively high vitamin C content.

Time of Picking and Vitamin C Content.

The guavas used in this test were obtained from the same orchard but unfortunately not from the same trees for each type. The successive pickings were at the same stage of ripeness.

TABLE IV.—*Vitamin C Content and Picking Time (Farm X).*

Date of Picking.	Mgms. Vitamin C 100 grams of fruit.			
	Type A.	Type B.	Type D.	Type E.
2/7/41............	171·4	215·4	—	—
9/7/41............	228·3	237·4	—	—
16/7/41............	223·1	281·2	—	—
23/7/41............	—	295·4	—	562·4
8/8/41............	—	—	484·4	557·4
21/8/41............	—	—	538·6	550·8
11/9/41............	—	—	—	633·4
24/9/41............	—	—	600·0	670·8

There is clearly an increase in vitamin C content as the season progresses (Table IV). It is interesting to note that the peak of the season for types D and E falls somewhere round about the end of September on this particular farm.

The following test was carried out on guavas canned at the same cannery at various periods ranging from April to November.

TABLE IVA.—*Vitamin C in Canned Guavas: Canned in the western Cape Province between April and November.*

Date of Canning.	Vacuum "Mercury."	Wt. of fruit per can (gms.).	Wt. of syrup per can (gms.)	Number of fruits per can.	Mgms. Vit. C 100 gms. syrup.	Mgms. Vit. C 100 gms. fruit.	Total Vit. C per can.	Vit. C in can per 100 grams fruit.	Remarks.
24/4/41	3	620	194	9	64·5	* (62·0)	(507·0)	(81·0)	Juice cloudy, orange-coloured flesh.
28/4/41	8	546	278	7	59·0	(57·0)	(471·0)	(86·0)	Juice clear, orange-coloured flesh.
30/4/41	2	555	284	12	54·0	52·0	441·0	80·0	Juice slightly cloudy, orange-coloured flesh.
30/4/41	10	540	302	11	45·0	(43·0)	(369·0)	(68·0)	Juice very clear, orange-coloured flesh.
29/5/41	7	551	305	8	91·0	86·0	752·0	136·0	Juice clear, orange-coloured flesh.
29/5/41	7	553	300	9	71·0	(68·0)	(592·0)	(107·0)	Juice clear, orange-coloured flesh.
30 5/41	8	530	304	—	108·0	(104·0)	(1,041·0)	(196·0)	Juice clear, orange-coloured flesh.
2/6/41	5	601	243	9½	137·0	(131·0)	(1,123·0)	(189·0)	Juice clear, white flesh.
9/6/41	5	520	243	14½	70·0	66·0	581·0	106·0	Juice clear, orange flesh.
4/7/41	9	492	361	14½	103·0	(98·0)	(857·0)	(174·0)	Juice clear, orange flesh.
4/7/41	8	610	223	10½	75·0	(71·0)	(596·0)	(98·0)	Juice clear, white flesh.
4/7/41	8	435	308	14	124·0	(118·0)	(982·0)	(226·0)	Juice clear; pink, orange and white flesh.
29/7/41	8	556	274	12½	187·0	178·0	(1,502·0)	271·0	Juice clear, mostly pink flesh.
31/7/41	7	564	284	10	145·0	(138·0)	(1,196·0)	(211·0)	Juice clear, pink and orange flesh.
5/8/41	7	554	318	8	148·0	(142·0)	(1,263·0)	(227·0)	Juice clear, mostly orange flesh.
5/9/41	7	564	283	6½	152·0	(145·0)	(1,252·0)	(222·0)	Juice clear, white flesh.
8/9/41	8	545	310	8½	204·0	194·0	1,686·0	310·0	Juice clear, white flesh.
8/9/41	8	618	228	—	279·0	(267·0)	(2,288·0)	(372·0)	Juice clear, white flesh.
8/10/41	8	571	277	9	237·0	228·0	1,961·0	342·0	Juice clear, pink flesh.
8/10/41	10	661	271	12	246·0	(235·0)	(2,227·0)	(336·0)	Juice clear, pink flesh.
16/10/41	10	546	293	13	308·0	(294·0)	(2,510·0)	(460·0)	Juice clear, pink flesh.
27/10/41	9	560	282	14½	245·0	(234·0)	(2,020·0)	(360·0)	Juice clear, pink flesh.
27 10 41	12	624	213	11½	323·0	(308·0)	(2,621·0)	(420·0)	Juice clear, pink flesh.
29/10/41	10	653	287	11	213·0	205·0	1,950·0	297·0	Juice clear, pink flesh.
29/10/41	9	596	255	10½	274·0	(261·0)	(2,260·0)	(380·0)	Juice clear, pink flesh.

* All figures given in brackets are estimated results.

The ascorbic acid was determined in the syrup of all the cans as well as in the actual fruit of every third or fourth can. As the ascorbic acid in the fruit was found to be of the order 95 per cent. of that found in the same weight of syrup, the results for the rest of the cans were estimated on this basis from the determined amount of ascorbic acid in the syrup. These estimated results are given in brackets (see Table IVA).

As the ratio of fruit to juice varies from can to can, the final comparison was made in regard to the total vitamin C present in the can per given weight of fruit. These figures are given in column 9 of Table IVA.

Table IVA and the accompanying graph (Graph 1) clearly indicate a sharp increase in vitamin C as the canning season progresses. As the vitamin C content of canned guavas is very stable and as all the samples had been processed in the same way, the only conclusion to be drawn is that the vitamin C in the fresh guavas progressively increased with the season. It is probable that the increase in vitamin C is attributable to richer and richer types maturing as the season progresses. It should be noted that all samples for this test were collected by Lieut. A. Loudon, Army Food Inspector, Cape Town.

Relation between Maturity and Vitamin C Content.

In the first test guavas of three stages of ripeness were picked simultaneously from the same tree. Table V indicates that this type of guava contains a fair amount of vitamin C even when very immature and that the vitamin C content increases with maturity.

TABLE V.

Stage of Maturity.	*Mgms. Vitamin C per 100 gms.*
Green: half-grown	163·8
Green: full-grown	188·3
Canning ripe	314·7

In the second test one tree of type E was specially left to allow of a good sample of tree-ripened fruit to be picked.

TABLE VI.

Maturity.	*Mgms. Vitamin C per 100 gms.*
Green but fully developed	588·2
Green with yellow at tip	600·0
Green with yellow tinge throughout	608·3
Yellow with a greenish tinge	633·4
Yellow and softening	603·7
Yellow and fully ripe	630·8

The ripe fruit was again generally higher in vitamin C content than the green fruit.

For the third test a commercial picking of guavas was taken. One type was sorted from the consignment and graded into six stages of ripeness according to colour.

TABLE VII.

Maturity.	Mgms. Vitamin C per 100 gms.
Green and hard	288·0
Green with tinge of yellow	290·6
Yellow with tinge of green	239·6
Yellow and ripe	256·0
Yellow and badly bruised	204·7
Yellow and overripe	247·8

The results (Table VII) were rather inconsistent and the riper fruits actually had a somewhat lower vitamin C content than the green fruit. In this test there may have been errors due to differences in type. It was clear, however, that even the badly overripe fruit

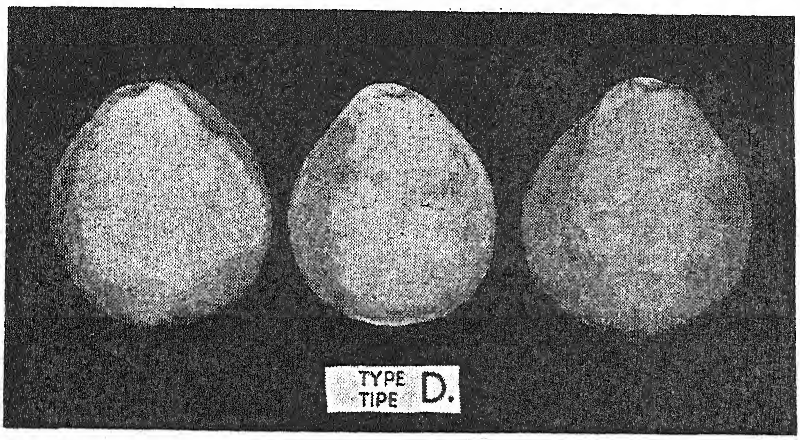


Fig. 4.—*Type D:* This is a very smooth-skinned, slightly pear-shaped and pink-fleshed guava, which is very firm when ripe. It is very popular with canners. The "Retief Baster" falls in this type, which is a mid-season to late variety.

still had a high vitamin C content. In another consignment of commercial fruit twelve exceptionally overripe fruits were chosen. These fruits were so soft that they could hardly be handled, yet the vitamin C content was 491·5 mgms. per 100 gms. as compared with 550·8 mgm. per 100 gms. in firm fruit of the same type.

In view of the great care which proved necessary in regard to maturity tests with guavas in order to avoid the errors due to type, a further series of tests was made with fruit picked from single trees. This series includes overripe fruit. Two trees of the Retief and Malherbe types were selected and the fruit allowed to remain on the trees until samples of badly overripe fruit could be collected. The fruit from each tree was picked and divided into 6 definite stages of ripeness, ranging from green and hard to badly overripe and unsaleable.

Another type, the Rossouw Guava, was also selected but unfortunately not enough fruit could be found on any one tree; so the fruit was picked from three trees and only three stages of maturity were collected from each tree. This type of guava, incidentally, is

excellent for eating in the fresh state. It has a delicious guava flavour, is very sweet and without the astrigency normally found in guava flesh, and is smooth to the palate.

TABLE VIIA.—*Vitamin C* vs. *Maturity*.

Stage of ripeness.	Mgms. Vitamin C 100 gms. fruit.		
	Rossouw type.	Malherbe type.	Retief type.
Yreen and hard	—	720·0	622·0
Gellowish green (softening)	—	684·0	614·0
Greenish yellow (canning ripe)	484·0	751·0	542·0
Yellow and fully ripe	522·0	761·0	583·0
Overripe	522·0	673·0	557·3
Badly overripe and unsaleable	—	697·0	476·0

The results shown in Table VIIA definitely confirm our previous findings that there is no material loss of vitamin C when the fruit is picked ripe. In the Retief type there is only a slight loss when the fruit is left to become totally overripe. But as guavas are never allowed to get to this stage in practice the slight loss is of no consequence.

Distribution of Vitamin C in Guava.

Vitamin C determinations were made on various portions of guava, viz. skin, outer flesh (peeled) and inner flesh with pips removed. (see Figure 6).

The guavas were peeled in the usual way as for canning, leaving as little flesh as possible attached to the peel. All samples were minced and the vitamin C extracted in the usual way.

TABLE VIII.—*Distribution of Vitamin C in the Guava.*

Sample.	Mgms. of Vitamin C per 100 gms. tissue.		
	Peel.	Outer flesh.	Inner flesh.
1	—	358·0	100·0
2	—	459·0	245·0
3	500·0	320·0	—
4	908·0	592·0	250·0
5	1,131·0	699·0	415·0

By far the richest source of vitamin C in the guava is the peel. Unfortunately in most homes and in some canneries the peel of the guava is discarded. Some canneries use the peel for making guava jelly. The process generally entails such vigorous boiling, however, that part of the vitamin C is destroyed. By dehydrating guava peels and pulverizing them, a powder is obtainable which has a vitamin C content of anything up to 6 per cent. which could be used for the purpose of vitaminizing foodstuffs.

It may also be observed that guava stews are often disliked on account of the mass of pips present. In view of the fact that the inner flesh and pips represent less than one third of the total weight and have a relatively low vitamin C content, the whole inner portion of the guava could be discarded, without losing more than, say, one sixth of the vitamin C content of the stew. In fact, there seems to be good grounds for retaining the skin and discarding the inner flesh

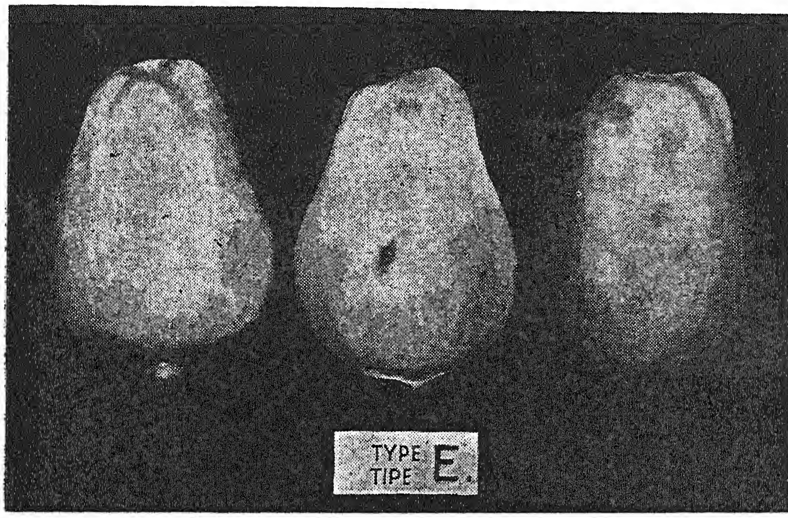


Fig. 5.—*Type E:* This is an elongated fruit, sometimes almost rectangular. In this fruit the outer flesh predominates. When ripe the flesh is a very distinct pink, almost the colour of ripe watermelon. The flesh is very firm and the type is popuar with canners.

and pips! For example, in a sample consisting of eight guavas of the E type the outer flesh (unpeeled) contained a total of 4680 mgms. of vitamin C as compared with 320 mgms. in the inner flesh.

Effect of Storage at Room Temperature on Vitamin C Content.

Guavas of apparently the same type were stored in open trays for a period of seven days. When received, these fruits were hard and green, but after seven days all the fruits were yellow and fit for eating.

TABLE IX.—*Storage at Room Temperature (average* 60° F.).

Days at Laboratory temperature.	*Mgms. Vitamin C per 100 gms.*
0	432·1
1	432·1
2	451·5
3	389·6
4	382·0
6	400·0
7	464·0

The results were inconsistent, apparently owing to differences in type, but it seems that no great loss of vitamin C was caused by a week's delay at room temperature.

A further test was made with guavas of the same stage of ripeness which were picked from the same tree (Malherbe type). This fruit was divided into 9 samples and placed in open trays at room temperature (70° F. to 75° F.) and one sample was analysed daily for vitamin C.

TABLE IXA.—*Vitamin C* vs. *ripening off the tree.*

Days off tree.	*Mgms. Vitamin C per 100 gms. of fruit.*
0	684·0
1	679·0
3	713·0
4	686·0
5	720·0
6	734·0
7	769·0
8	741·0

There was again no loss of vitamin C during ripening at room temperature (Table IXA). In fact, there was a gradual increase which was probably due to the transpiration of water. The sample left for 8 days was soft and fully ripe.

Stewed Guavas.

Guavas are eaten either in the fresh or in the stewed state. It is, therefore, of interest to determine the loss of vitamin C during stewing. Although the normal stewing time is approximately 20 minutes, the present stewing process was purposely continued for an hour. The guavas were minced and the requisite amount of sugar added. This pulp was weighed and allowed to simmer on a hot plate with regular stirring, the loss in weight being made good by the addition of distilled water.

The average vitamin C contents for four samples of guava pulp before and after simmering for 1 hour and cooling for approximately ½ hour are shown in Table X.

TABLE X.

Treatment.	*Mgms. Vitamin C per 100 gms. pulp.*
Control (fresh)	470
After 1 hour's stewing	443

It is noticed that the relative loss of vitamin C during the process of stewing is small.

II. Stability of Vitamin C in Guava Products.

As a result of recommendations made by this Laboratory guavas have been canned in very large quantities during the past season. It is common knowledge that the Department of Defence has used canned guavas as a source of vitamin C in the diet of troops in North Africa. The canned guava is palatable and represents a concentrated and extremely stable source of this vitamin. The cost per unit of

vitamin C is low in comparison with other natural sources, and it seems that canned guavas represent an extremely popular canned fruit.

Tests to Determine Stability.

Extensive tests were carried out at the Laboratory during the 1940 and 1941 seasons to determine the stability of the vitamin C in canned guavas and guava products when stored at tropical temperatures. During the 1940 season samples of freshly canned guavas were obtained from two canneries; the samples consisted of three marks, viz. (1), (2) and (3). Mark (1) contained the largest fruits and mark (3) the smallest. The results of the storage trials are shown in Table XI.

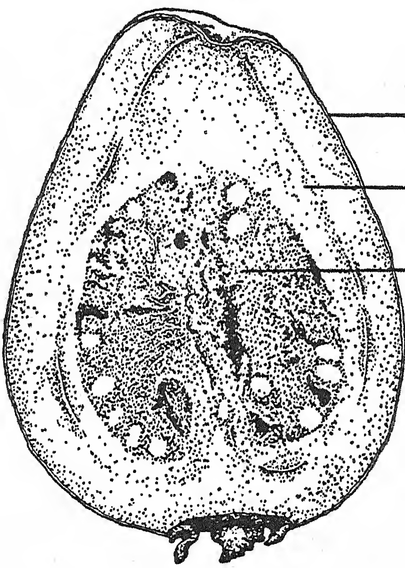


Fig. 6.—A cross section of a guava showing arrangement of skin, flesh and pips.

Although there was a definite loss of vitamin C during the 3½ month's storage at 98° F., the loss was extremely slow when compared with the loss in concentrated orange juice, which is of the order of 50 per cent. in 1 month of 98° F. After 3½ months' storage the cans still had vacua ranging from five inches to twelve inches and the guavas were all sound, but slightly more mushy than the freshly canned product. The cans were unlacquered and showed slight feathering. The relatively slow loss of vitamin C has been confirmed with guavas of the 1941 season. The cans were stored over a range of temperatures from 70° F. to 130° F. and the results shown in Table XII represent the averages for three whole cans of fruit (i.e. fruit and syrup together). The control cans contained 262·0 mgms. vit. per 100 grams.

TABLE XI.—*Storge of Canned Guavas at 98° F.*

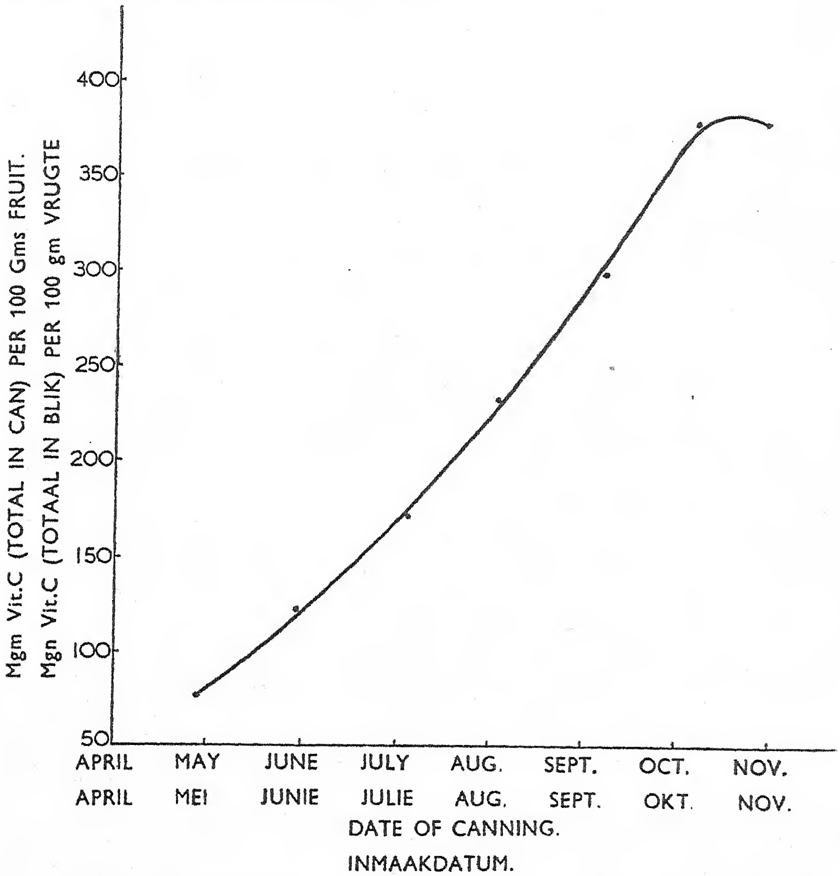
Fruit Tested.	Period 98° F. at (Months).	Weight of fruit grams.	Weight of juice grams.	Mgms. Vitamin C 100 gms. juice.	Mgms. Vitamin C 100 gms. fruit.	Vitamin C content of can (mgms.).
From First Cannery Mark 1........	0	494	320	314·0	298·0	2,479·6
	1	525	295	293·0	285·0	2,362·1
	2	520	320	279·0	264·0	2,265·2
	3½	510	315	231·0	225·2	1,875·3
Mark 2.......	0	479	385	285·0	252·0	2,303·5
	1	515	330	284·0	291·0	2,437·1
	2	486	335	268·0	273·0	2,225·2
	3½	476	345	211·0	212·0	1,738·1
Mark 3	0	474	365	273·0	266·0	2,254·5
	1	505	340	273·0	271·0	2,294·2
	2	506	340	245·0	244·0	2,060·1
	3½	520	310	229·0	226·0	1,887·5
From Second Cannery— Mark 1.......	0	538	285	343·0	316·0	2,677·5
	1	530	310	332·0	320·0	2,725·4
	2	506	335	289·0	283·0	2,400·0
	3½	580	245	270·0	269·0	2,200·3
Mark 2.......	0	503	345	272·0	269·0	2,293·8
	1	535	275	290·0	275·0	2,268·7
	2	526	295	274·0	276·0	2,259·3
	3½	496	355	209·0	192·0	1,694·0
Mark 3.......	0	543	305	281·0	264·0	2,291·4
	1	565	285	228·0	234·0	1,969·0
	2	476	335	233·0	235·0	1,898·6
	3½	535	315	179·0	172·0	1,484·9

TABEL XII.—*Storage of Canned Guavas.*

Storage Temperature.	Vitamin C in Mgms. per 100 gms (fruit and syrup).	
	3 week's storage.	6 weeks' storage.
70°F.	273·0	256·0
85°F.	302·0	288·0
98°F.	273·0	281·0
110°F.	260·0	195·0
130°F.	200·0	112·0

Unfortunately the cans originally differed greatly in vitamin C content, and it may be stated that further tests are contemplated with guavas of uniform type, stage of maturity, etc., and canned in the Laboratory under carefully controlled conditions. In the control four cans were analysed separately and the vitamin C content

varied from 234 mgms./100 gms. to 311 mgms./100 gms. The evidence definitely tends to indicate, however, that the loss in vitamin C from canned guavas is extremely slow in comparison with that from other products such as concentrated orange juice. It may be interesting to note that concentrated orange juice lost practically all its vitamin C within a week at 130° F.



Graph 1.—Vit.C CONTENT IN RELATION TO DATE OF CANNING (*SEE* TEXT)

Grafiek 1.—Vit. C-GEHALTE MET BETREKKING TOT DIE INMAAKDATUM (*KYK* TEKS).

Fig. 7.—Graph showing vitamin C content in relation to date of canning.

The cans generally maintained a vacuum, even at 130° F, except in the case of a few cans. In these cans the syrup was cloudy and unattractive in colour, but the spoilage seems to have been due to faults in can-making or canning, as two such cans were found at 70° F. and 85° F., whilst none occurred at 98° F. or at 110° F. Two cans stored at 130° F. were blown, both during the first three weeks of storage—no further blowing of cans occurred during the further three weeks of storage. It should also be stated that all the cans stored at 130° F. showed considerable feathering. After 3 weeks' storage at this high temperature the syrup had a cloudy appearance; after 6 weeks the syrup and guavas had developed an unattractive brownish colour.

Guava Jelly.

Samples of guava jelly, which is commercially prepared from the peels of guavas, were stored at 98° F. for 1, 2, and 3½ months, and the results are given in Table XIII.

Table XIII.—*Guava Jelly.*

Storage period (months).	*Mgm. Vitamin C 100 gms. jelly.*
0	246·0
1	245·0
2	224·0
3½	179·0

Guava jelly has a high vitamin C content, comparable with that of canned guavas and the loss in vitamin C during storage at 98° F. is equally slow. After 3½ months' storage the jelly had altered slightly in colour but the flavour remained unimpaired.

Concentrated Guava Extract.

Among the preliminary attempts which were made to obtain from the guava a product rich in vitamin C, which could be used for purposes of vitaminization, was the preparation of water extracts.

Extracts of similar strengths were obtained after squeezing through 180 mesh silk, whether cold or boiling water was used. The extracts were mixed, the resultant mixture having a T.S.S. of 3·1 per cent. and a vitamin C content of 39·8 mgs. per 100c.c. This extract was divided into 3 portions of 2 litres each which were concentrated in a vacuum pan at 110° F.

Table XIV.—*Vitamin C Content of Guava Concentrate after Six Weeks' Storage.*

Sample.	Storage temperature.	Mgms. Vitamin C 100 gms. after storage.	Mgms. loss in Vitamin C during storage.
(*a*) 15 gms. yeast and 2 gms. Pectinol A.	98° F.	229·0	1,281·0
(*b*) 2 gms. Pectinol A.	98° F.	141·9	530·0
	110° F.	87·7	584·0
(*c*) Plain extract.	32° F.	116·6	70·7
	70° F.	103·2	83·6
	98° F.	87·7	99·1
	110° F.	58·1	128·7

It may be noted that although Sample (*c*) had a T.S.S. of only 15 per cent., it was thick and resembled jelly, whilst samples (*a*) and (*b*) were still fluid even at T.S.S. levels of 50·0 and 67·0 per cent. respectively.

Table XIV clearly indicates that although a product of high vitamin C content may be obtained by concentrating guava extract, the vitamin C is unfortunately lost very rapidly even when the product is stored at a temperature as low as 32° F. The present process must therefore be considered of no practical value; but it is of considerable scientific interest in connexion with fundamental work in progress at the laboratory.

Dried Guavas.

Preliminary tests in connexion with the drying of guavas have indicated an interesting field of investigation and the tests are being continued.

Three similar samples were obtained by cutting each guava of the consignment into three segments. The inner flesh and pips were removed and two samples sliced for drying, whilst the third served as fresh control.

Blanching was achieved by boiling in a minimum of water for 3 minutes and drying was performed in a small dehydrator utilizing forced-air circulation at 130° F., the slices being dry and crisp after 18 hours. On soaking the slices very nearly regain their original shape and colour, and the material could be used for the preparation of guava stews. The dried product was readily powdered in a laboratory mill.

TABLE XV.—*Dried Guava.*

Sample.	*Mgms. Vitamin C per 100 gms.*
Fresh	568·0
Dry (blanched)	1,251·0
Dry (unblanched)	2,619·0

The low vitamin C content of the blanched sample is probably due to leaching during blanching. It may be interesting to note that for the unblanched sample the loss in weight was 86·0 per cent. The loss in vitamin C during drying amounted to 36·3 per cent. of the original content. It has been stated by Goldberg that a higher vitamin C content results from the blanched than from the unblanched material. The method of blanching is not indicated but it is assumed that the findings refer to steam blanching.

Tests are in progress regarding the stability of the vitamin C in the dried material during storage. It may be noted that in a preliminary test the results, as indicated in Table XVI were not very promising. The loss of vitamin C from guava powder stored in sealed bottles at tropical temperatures was much more rapid than that from canned guavas.

TABLE *XVI.—Vitamin C in Guava Powder after Three Weeks' Storage.*

Storage Temperature.	*Vitamin C after 3 weeks' storage (Mgms./100 gms.)*
Before Storage	3,355·0
70° F.	3,070·0
85° F.	2,870·0
98° F.	2,690·0
110° F.	2,309·0
130° F.	986·0

In a preliminary test a sample of the above powder was dried in air at 160° F. for four hours prior to storage. The loss of vitamin C during the actual drying was severe (2355·0 mgm./100 gm. to 2051·0 mg./100 gm.), but the subsequent loss during storage at 98° and 110° F. was very much lower than in the case of the undried sample.

TABLE XVII.—*Vitamin C in Dried Guava Powder after Three Weeks' Storage.*

Storage Temperature.	*Vitamin C after 3 weeks' storage (Mgms./100 gms).*
Before Storage	2,051·0
98° F.	1,935·0
110° F.	1,928·0

Tests are being continued with a view to evolving improved methods of drying in inert gases and packing.

It should also be stated that this progress report includes a number of preliminary readings and that the investigations are continuing.

Summary.

South African guavas are not yet classified into varieties. Five main types of fruit are described in this article, and it is shown that the vitamin C content depends greatly on the type of guava in question. Early-season guavas are generally lower in vitamin C content than later-season types.

The vitamin C content does not always seem to be greatly dependent on maturity, but there may be exceptions. The skin and outer flesh of the guava are richest in vitamin C.

Very little vitamin C is lost in the stewing of guavas.

Concentrated guava extract lost its vitamin C very rapidly but canned guavas proved to be remarkably stable under adverse conditions. Dried guavas and guava powders have been prepared; though rich in vitamin C, the potency is rapidly lost in warm climates.

Investigations regarding the vitamin C content of the guava and guava products and the stability of the product and its vitamin during storage are being continued at the Laboratory.

Soybean-meal as a Source of Protein in Poultry Rations.—

[*Continued from page* 318.

Owing to the small quantities of seed produce, it is not yet possible to use soybean-meal in poultry rations on a large scale. It is hoped that the time will come when, adequate supplies being available, this nutrient will contribute to the more economical feeding of poultry.

Where at all possible, poultry farmers having available ground should cultivate soybeans on a large scale. This will prove useful in that less feed will have to be purchased. Sources of protein are scarce and prices are high, and the position may become worse in future. If the farmer is able to cultivate and bake soybeans for his own use, he will find it possible to save on the transport costs of other feeds which are also sources of protein.

Soybeans can be baked on the farm; the process is the same as that for roasting coffee. A soap cauldron will be suitable for this purpose. Whole beans are placed in the hot cauldron and stirred constantly to ensure uniform roasting. The beans are suitable for feeding purposes as soon as the bitter tase has disappeared. At this stage the beans have an attractive brown colour; they are palatable and are readily eaten by the fowls. After having been

[*Continued on page* 340.

Trace Element Deficiencies in Citrus.

Results Obtained in the Eastern Transvaal.

Dr. J. I. de Villiers, Research Horticulturist, Subtropical Horticultural Research Station, Nelspruit.

DURING the past ten years several formerly obscure diseases in plants of economic importance have been traced to deficiencies of elements which are required either in relatively small or in minute amounts. Such elements, to the deficiency of which abnormalities in the growth and fruits of citrus have been ascribed in various parts of the world, are magnesium, zinc, iron, copper, manganese and boron.

Of these, a lack of boron, which causes "hard fruit" in Southern Rhodesia, has never been observed in the eastern Transvaal. A positive reaction, exhibited by an intensification of the green appearance of the tree, has been obtained after the application of manganese, but an actual deficiency has never been demonstrated. A copper deficiency has been found only once and symptoms indicative of an insufficiency of iron have been encountered only rarely under field conditions. On the other hand, zinc deficiency, causative of mottle-leaf and little-leaf and a certain amount of leaf-drop and die-back, is widespread in the Union and occurs to a greater or lesser degree in most orchards in the lowveld.

Effects of Deficiencies.

As the names little-leaf and mottle-leaf imply, zinc deficiency causes a reduction in leaf-size and the appearance of yellow patches in interveinal areas owing to the failure of chlorophyll to develop there or the destruction of chlorophyll already formed. Badly affected leaves may show only a narrow strip of green tissue on either side of the veins and occasional leaves may be devoid of any green colour whatsoever. The illustration depicts typical zinc-deficient leaves.

Magnesium deficiency, too, may be observed in most orchards on acid soils in this area, causing a partial chlorosis termed bronzing, a certain amount of leaf-drop, and possibly a reduction in fruit size. It has been stated to occur also in the western Cape Province and western Transvaal, but it is comparatively rare in other parts of the Union. The symptoms have been described quite recently by Oberholzer* and are not discussed here.

These two deficiencies, which exhibit fairly specific symptoms, as well as those of manganese, copper, iron and boron, must not be confused with a lack of nitrogen which results in a general paleness in the appearance of the tree. It is useless to treat a tree with zinc, magnesium, or any other nutrient element when its paleness, lack of vigour, and defoliation are due to nitrogen starvation.

Treatment of Trees.

The most effective way to provide the tree's requirement of *zinc* where this element is not supplied by the soil in sufficient quantities

* Oberholzer, P. C. J.—"Suspected Magnesium Deficiency in Citrus". *Farming in S. Africa*, Vol. 16, No. 184, p. 235, July 1941.

in an available form, is to spray it onto the leaves after it has been precipitated from solution. The following procedure has consistently given good results in the treatment of mottle-leaf:—Dissolve 10 lb. of commercial zinc sulphate in 100 gallons of water. After it has dissolved, add 5 lb. of slaked lime (commercial calcium hydroxide) made into a paste with a little water, while stirring the solution. On the addition of the slaked lime paste, the zinc comes out of solution as a precipitate which is kept in suspension by stirring while the spray is applied.

Magnesium is required by plants in very much larger quantities than zinc and it is doubtful whether the tree's needs can be met indefinitely by supplying it as a spray. Where bronzing occurs, a soil application of about 10 lb. magnesite, together with about 15 lb. of agricultural lime, per tree per year for 2 or 3 years is recommended. After this it need be applied only infrequently. However, the tree responds very slowly to magnesium compounds added to the soil, trees with marked symptoms of bronzing often showing no improvement 3 years after applications of magnesium-carrying materials have been made. Such trees, however, respond readily to sprays containing this element, especially when they are not starved for nitrogen at the same time. It is therefore considered advisable to spray the tree during the period before soil applications become effective. Of the various materials containing magnesium, a 2 per cent. suspension of finely ground burnt dolomite is as effective a spray as any and cheaper than most. The suspension is prepared simply by making a paste of burnt dolomite and water and adding it at the rate of 20 lb. of dry powder to 100 gallons of water while stirring vigorously.

Preparation of Sprays.

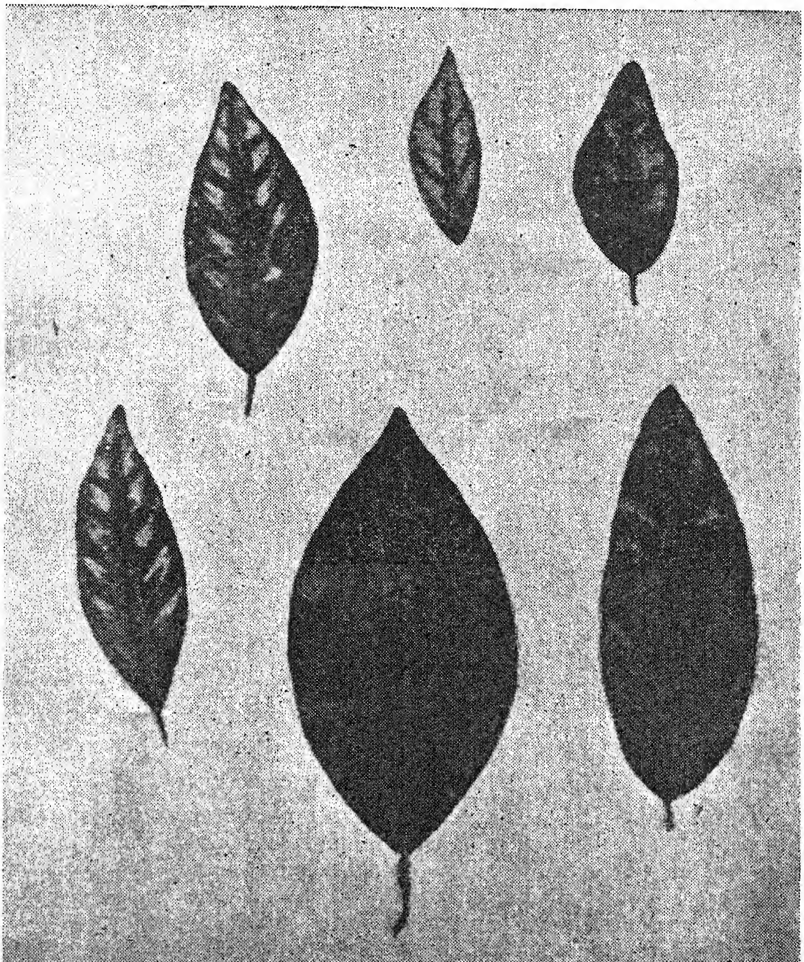
Zinc and magnesium deficiencies often occur in the same orchard; in fact, as the symptoms of the one in greater deficiency often obscure the symptoms of the other, they occur together more often than their symptoms would lead one to believe. In that case zinc and magnesium are applied in the same spray, the zinc sulphate at 0·5 to 1·0 per cent. and the burnt dolomite at 2 per cent. (i.e., 5 to 10 lb. zinc sulphate and 20 lb. dolomite per 100 gallons). The zinc sulphate is first dissolved and the burnt dolomite then added as a paste. When used together the addition of slaked lime to precipitate the zinc is unnecessary as the burnt dolomite acts as the precipitant.

As burnt dolomite and slaked lime contain a certain amount of gritty material, which will cause unnecessary wear of spraying equipment, it is essential to prepare the sprays in suitable containers (like oil drums, for example) before drawing the fine suspension into the tank of the spray pump. Where zinc and magnesium are sprayed on together, the following simple procedure may be followed:—For 240 gallons of spray, dissolve 12 to 24 lb. of zinc sulphate in a drum containing 40 gallons of water. If the salt is lumpy, it is first crushed. Stir until dissolved, then draw the solution into the spray-pump tank. To each of two other drums add 24 lb. of burnt dolomite as a paste, stir vigorously, then allow the rotating suspension to slow down and, while stirring slowly, draw it into the tank of the spray pump through a fine gauze over the end of the filler pipe until liquid and sediment to a depth of only about 3 inches are left in the drum. This, consisting largely of fine sand and coarser dolomite particles, is discarded.

In this way about 120 gallons are brought into the pump's tank. During the drawing in of the dolomite suspension the gauze over the

end of the filler pipe becomes clogged and has to be cleaned by dipping it into clean water and shaking it vigorously while the sucking-in continues. In this way more water is introduced into the tank. When the dolomite suspension has all been drawn in, the tank of the spray pump is filled to the 240-gallon mark. For smaller tanks and when hand-pumps are used, this general procedure is adapted to suit requirements.

The necessity for using a spreader-sticker depends on circumstances. The spray suspension usually spreads well over the surfaces of the leaves and, as it is insoluble in water, it is not easily washed off by rain once it has dried. However, after trees have been oil-sprayed or when they have made a good flush, it is inclined to run off, especially from young leaves. When that happens, a spreader-sticker, at the concentration recommended by the manufacturer, is added after it has been made into a paste with water.



Leaves showing typical zinc-deficiency symptoms. The central leaf in lower row is normal in colour and size. The others are reduced in size and exhibit interveinal chlorotic patches which are due to zinc deficiency.

Time of Spraying.

To avoid having spray-stained fruit at picking time the first spray should be applied as soon as possible after the crop has been removed. Unless the foliage is still very well covered with spray residue, this should be followed 2 months later by a second spray. The amount of spray per tree depends on the size of the tree, the object being to apply sufficient to cover the foliage thoroughly. Usually 3 to 4 gallons are enough for a 5-year-old tree and 5 to 6 gallons for a big one.

Magnesium-containing sprays will have to be continued at the rate of two per year for the first two years; later perhaps one per year, till soil applications become effective after about 4 years. Zinc-containing sprays may, after the mottle-leaf has been cured, be reduced to one per annum, the reappearance of mottling being the guide.

It has been stated that deficiencies of the other trace elements mentioned earlier occur in this area only rarely in the field. It is possible, of course, that after the greater deficiencies of zinc and magnesium have been met, elements which now appear to be present in sufficient quantities may become limiting factors in production.

Soybean-meal as a Source of Protein in Poultry Rations.—

[Continued from page 336.

baked, the beans are ground in order to be mixed with the mash. The beans should on no account be roasted until black in colour as this will destroy their nutritive value.

A Suitable Ration.

Poultry rations in which baked soybean-meal is included may be composed as follows:—

	Laying Ration. lb.	*Chicken Ration.* lb.
Yellow Mealiemeal	45	48
Maize Germ Meal	10	10
Lucerne Meal	10	10
Oat or Barleymeal	10	10
Meatmeal (55% Proteins)	13	11
Baked Soybean-meal	12	11
Bonemeal	3	—
Powdered Oystershell	2	1½
Fine Salt	1	1

In the case of a laying ration, the hens receive yellow mealies as a grain feed. Chickens receive only a mash (the chicken ration) until they reach the age of 6 weeks; thereafter they are fed on the laying ration and yellow mealies. The hens, as well as the chicks should receive an adequate supply of green feed. Laying hens should be provided with oynstershell in separate hoppers so as to enable them to consume as much thereof as is necessary for egg production. Chicks need receive no additional oystershell; instead, fine grit should be made available to them in separate hoppers. Where meatmeal is not procurable, an equal quantity of fishmeal may be substituted.

Official Milk Records.

Herd Averages for Registered Cows during 1940-41.

The average milk and butterfat records for registered herds officially tested during the year 1st September, 1940 to 31st August, 1941, are given hereunder. These figures are only in respect of registered herds of which all cows have been tested, and the records of all cows which completed a lactation during the period covered, are included. The records of cows which were in milk for less than 120 days, or which died or were disposed of before completing their lactations, have been omitted in calculating the herd averages. Herds of fewer than five cows, and herds of which only selected cows were tested are not included in these averages.

Owner's Name and Address.	Milk, lb.	Butterfat, %	Butterfat, lb.	Days.	Number of Cows.						
					Mature.	Snr. 4	Jnr. 4	Snr. 3	Snr. 3	2 Years.	Total.
FRIESLAND HERDS.											
S. D. le Roux and Son, Onverwag, Oudtshoorn, C.P.	14,567·1	3·642	530·600	300	6	1	—	1	—	3	11
S. Fourie. P.O. Box 142. Oudtshoorn, C.P.	13,247·3	3·509	464·831	300	3	—	—	—	—	4	7
Van Niekerk Bros., Brakfontein, Bedford, C.P.	12,332·4	3·715	458·167	300	18	2	5	1	11	21	58
Grootfontein College of Agriculture, Middelburg, C.P.	13,333·0	3·255	433·971	300	12	—	1	—	3	3	19
A. A. Kingwell and Sons, Colonies Plaats, Graaff-Reinet, C.P.	11,608·8	3·686	427·867	293	11	1	—	—	2	15	29
J. J. Starke, Muldersvlei, C.P.	11,689·6	3·629	424·223	300	4	1	2	1	1	3	12
W. J. H. Spence, Pomona, P.O. Box 66, Marquard, O.F.S.	12,833·8	3·292	422·516	300	1	1	4	2	1	2	11
D. F. Muller, P.O. Box 26, Lady Grey, C.P.	11,227·4	3·745	420·520	299	8	1	2	2	2	15	30
J. N. le Roux, Jnr., De Luc, P.O. Vinies, O.F.S.	12,263·6	3·415	418·790	300	2	1	—	—	2	2	7
Frasers Ltd., Aanvang, Wepener, O.F.S.	11,314·7	3·689	417·365	299	10	2	—	4	3	1	20
A. A. Montgomery, Hillside, P.O. Vineyard, C.P.	10,698·4	3·870	413·999	299	8	—	—	—	—	1	9
S. L. van Niekerk, Kamnatie Loop, Oudtshoorn, C.P.	11,783·3	3·513	413·942	300	5	—	2	—	1	2	10
Sir de V. Graaff, Bart, De Grendel, Tygerberg, C.P.	11,730·1	3·514	412·226	285	23	1	4	1	8	8	45
D. W. du Preez, Langverwyl, P.O. Box 20, Standerton, Tvl.	12,139·5	3·384	410·757	300	7	1	—	—	—	—	8
J. H. Gertzen, Snr., Heathdale, Middelburg, C.P.	10,530·4	3·886	409·176	300	7	—	2	—	2	—	11
J. J. J. van Rensburg and Son, Erfdeel, P.O. Box 10, Hennenman, O.F.S.	11,349·4	3·581	406·419	300	5	—	3	—	2	4	14
Geo. Fergusson, P.O. Box 449, Benoni, Tvl.	11,517·9	3·471	399·774	293	6	1	1	1	1	7	17
A. E. Murray and Sons, Bloemhof, Glen Harry, C.P.	10,889·2	3·623	394·529	279	5	—	6	—	1	5	17
W. M. Pfaff. P.O. Box 125, Ermelo, Tvl.	11,296·6	3·472	392·235	300	5	—	—	—	—	2	7
R. L. Gilson, Hermon, Franklin, E.G.	11,536·6	3·373	389·126	296	16	3	2	3	2	4	30
Stellenbosch-Elsenburg College of Agriculture, Muldersvlei, C.P.	10,858·8	3·576	388·281	297	12	5	7	3	4	9	40
Le Roux van Niekerk, The Gem, Somerset East, C.P.	10,378·9	3·700	384·040	283	3	2	—	—	—	2	7
W. P. Harris and Sons, P.O. Box 249, Kimberley, C.P.	10,807·5	3·496	377·777	299	15	1	—	6	5	6	33
Mental Hospital, Bloemfontein, O.F.S.	11,214·8	3·369	377·773	299	16	—	2	3	2	5	28
I. P. Meyer, Moreuil, Bethlehem, O.F.S.	11,116·6	3·396	377·545	262	5	—	1	—	—	—	6
Ross and Sons, Cavers, Bedford, C.P.	11,051·9	3·413	377·148	300	9	—	2	—	—	4	15
School of Agriculture, Tweespruit, O.F.S.	9,885·0	3·815	377·075	295	4	1	2	—	2	2	11
Mental Hospital, Queenstown, C.P.	10,579·6	3·549	375·448	293	6	1	1	1	5	2	16
D. S. E. Marais, Fern Grove, Lady Grey, C.P.	9,087·0	4·127	375·047	300	5	—	—	1	—	3	9
Estate Late J. I. Starke, Muldersvlei, C.P.	10,748·7	3·463	372·192	292	17	1	3	3	3	4	31
Orpen and Son, Avoca, New England, C.P.	9,970·6	3·689	367·802	300	4	2	1	1	3	7	18
J. C. Landman, Eerstegeluk, Queenstown, C.P.	9,683·9	3·726	360·814	299	5	2	5	2	3	9	26
P. G. Nelson, Schoonspruit, Malmesbury, C.P.	10,751·6	3·351	360·244	292	8	4	2	3	3	3	23

T. E. Murray and Sons, Roodebloem, Graaff-Reinet, C.P.	10,013·4	3·572	357·671	289	12	—	2	6	2	8	30
A. J. Combrink, Bloubank, Edenburg, O.F.S.	10,382·3	3·430	356·062	283	5	2	1	2	2	6	18
W. A. Landman, Hopefield, P.O. Lehmansdrift, C.P.	8,758·0	4·058	355·386	300	4	1	1	5	1	7	19
E. Stephenson, P.O. Box 3, Lady Grey, C.P.	9,993·9	3·523	352·131	288	7	1	—	—	2	2	12
J. O. Steyn, Croxteth, P.O. Vineyard, C.P.	9,453·9	3·721	351·745	300	7	2	—	1	3	1	14
Pieter Olivier, The Towers, Oudtshoorn, C.P.	10,759·5	3·263	351·115	286	9	3	3	3	1	4	23
F. J. van Zyl, Langverwacht, Bonnievale, C.P.	10,210·3	3·416	348·805	298	8	7	4	5	1	4	29
Dodds Bros., Thibet Park, Waverley, C.P.	9,450·9	3·666	346·490	292	6	1	3	3	2	1	16
Isted and Son, Halstone, Wartrail, C.P.	10,052·8	3·458	345·837	292	5	2	1	—	1	2	11
S. G. Basson, Doornfontein, Malmesbury, C.P.	9,647·1	3·560	343·416	296	2	2	1	—	1	2	8
Valkenberg Mental Hospital, Observatory, C.P.	9,767·1	3·504	342·197	300	10	3	—	2	1	2	18
College of Agriculture, Glen, O.F.S.	9,252·8	3·612	334·191	297	6	2	1	1	—	7	17
N. R. Torr, Mountain View, Burghersdorp, C.P.	8,855·3	3·762	333·151	296	—	—	1	3	1	—	5
D. J. Marais, Marloura, P.O. Glenroy, Tvl.	10,184·7	3·270	332·983	294	5	—	—	—	2	—	7
Mrs. C. M. Vosloo, Klipfontein, Bedford, C.P.	9,092·8	3·658	332·572	294	3	3	1	—	1	2	10
P. Hourquebie, Rosetta, Natal	9,539·7	3·476	331·561	298	7	1	1	7	4	7	27
J. S. Vermaak, Vermaakskraal, Helpmekaar, Natal	8,695·5	3·796	330·038	299	—	—	—	—	2	3	5
College of Agriculture, Potchefstroom, Tvl.	9,003·1	3·645	328·185	270	1	—	2	—	1	2	6
H. G. H. Brown, Schaffhausen, Waku, C.P.	9,483·5	3·440	326·229	298	11	1	1	2	3	7	25
Edward Starke, Joostenberg, Muldersvlei, C.P.	8,942·1	3·645	325·960	295	13	2	—	4	1	8	28
Jack Starke, East Hill, Muldersdrift, C.P.	9,002·9	3·619	325·854	295	6	3	1	1	2	5	18
S. L. S. Cloete, Malangskraal, P.O. Bedford, C.P.	8,775·9	3·703	324·967	290	12	1	1	4	4	10	32
Baynesfield Estate, Nels Rust, Natal	8,986·1	3·606	324·080	300	39	19	8	13	8	19	106
J. H. le Roux and Son, Bakenskraal, Oudtshoorn, C.P.	8,797·5	3·658	321·798	291	21	6	1	10	2	25	65
C. Schwartz, Corona, P.O. Box 7, Virginia, O.F.S.	8,951·1	3·570	319·587	283	2	—	—	1	—	4	7
Marlow Agricultural Training School, P.O. Box 40, Cradock, C.P.	8,764·9	3·617	317·053	282	4	1	—	—	1	4	10
H. W. Stockdale, Alma, Clocolan, O.F.S.	8,817·7	3·590	316·599	291	9	9	7	6	—	1	32
J. J. Botha, Angora, Bonnievale, C.P.	9,697·9	3·263	316·446	237	2	3	1	1	—	—	7
Agricultural Research Institute, Experiment Farm, Pretoria, Tvl.	8,166·3	3·872	316·176	294	—	—	1	1	1	2	5
N. C. Havenga, Allanvale, Memel, O.F.S.	8,669·9	3·638	315·405	287	7	1	—	4	1	2	15
Max Naude, McCabespruit, Clocolan, O.F.S.	8,965·9	3·507	314·432	290	4	—	4	4	—	6	18
J. J. Seimons, Gouwsplant, P.O. Box 47, Excelsior, O.F.S.	9,775·2	3·209	313·716	295	4	—	—	—	2	5	11
Geo. Dunbar, P.O. Box 11, Delmas, Tvl.	9,856·7	3·158	311·309	296	14	5	3	4	7	15	48
Irvington Dairy, 33 Haig Road, Durban, Natal	9,572·9	3·227	308·876	247	11	—	1	1	—	—	13
D. W. van der Vyver, P.O. Box 674, Bloemfontein, O.F.S.	8,944·7	3·446	308·225	300	2	—	1	—	1	1	5
Field-Marshal J. C. Smuts, Doornkloof, Irene, Tvl.	8,996·5	3·415	307·258	275	8	2	1	2	3	5	21
E. Emmott, P.O. Midway, Tvl.	9,166·3	3·336	305·749	286	6	2	—	3	3	3	17
J. van A. Bekker, Kortaf, Aliwal North, C.P.	8,461·8	3·587	303·534	299	—	—	—	—	1	6	7
J. S. Henning, Sweetwaters, Louis Trichardt, Tvl.	8,443·8	3·538	298·752	300	2	—	—	2	3	7	14
Jannie Pretorius, Golden Valley, Molteno, C.P.	8,604·6	3·462	297·914	296	5	—	1	1	1	—	8
W. A. Shaw, Shaftesbury, Westminster, O.F.S.	9,091·5	3·216	292·344	295	5	1	2	1	4	—	13
D. Beal-Preston, Exwell Park, Waku, C.P.	7,195·8	3·976	286·110	262	3	—	—	1	2	—	6
G. J. Veenstra, Shirley, Mooi River, Natal	8,085·6	3·533	285·673	296	7	3	3	3	1	2	19
M. Schultz, P.O. Box 71, Davel, Tvl.	8,777·3	3·197	280·615	290	4	—	1	—	1	1	7
Reg. R. Cullinan, Olifantsfontein Rail, Tvl.	8,713·6	3·217	280·330	300	4	2	2	—	—	—	8
A. and E. G. Wevell, P.O. Box 59, Bethal, Tvl.	8,172·4	3·418	279·323	300	5	1	—	—	—	1	7
Harrowdene Estates, P.O. Box 6101, Johannesburg, Tvl.	8,883·0	3·135	278·512	295	5	—	—	1	2	2	10
Thos. S. Leask and Co., Highlands, Wolmaransstad, Tvl.	8,315·6	3·339	277·694	291	5	—	2	—	—	—	7
P. W. Michau, Doornhoek, Cradock, C.P.	7,538·1	3·664	276·203	243	9	5	—	1	3	7	25
Estate Late C. W. Champion, Balaclava, Tweespruit, O.F.S.	7,515·0	3·632	272·942	299	4	1	—	2	3	2	12
Bowes Bros., Lily Vale, Queenstown, C.P.	6,978·4	3·904	272·413	281	8	—	5	4	2	1	20
Mrs. S. Brown, Rietfontein, P.O. Meadows, O.F.S.	7,899·4	3·428	270·784	300	6	2	2	—	—	4	14
M. M. Edwards, Chiapinnisklip, Burghersdorp, C.P.	7,100·3	3·783	268·578	292	10	—	1	3	1	—	15
N. A. Kiddie, Rooidam, P.O. Modder River, O.F.S.	8,153·5	3·283	267·691	300	4	1	1	—	—	9	15
A. Neizel, Erasmusdam, Glenisla, Natal	7,261·7	3·606	261·858	297	4	—	—	1	1	4	10
F. A. Davidson, Branksome, P.O. Mosheshsford, C.P.	7,131·8	3·606	257·187	285	3	1	—	—	3	4	11
Oosthuisen Bros., P.O. Box 5, Alexandria, C.P.	7,540·1	3·403	256·598	266	6	1	—	—	1	—	8
Brown and Sons, Glen Avon, Somerset East, C.P.	7,645·5	3·319	253·743	292	5	—	—	1	2	4	12

Owner's Name and Address.	Milk, lb.	Butterfat, %	Butterfat, lb.	Days.	Number of Cows.						
					Mature.	Snr. 4	Jnr. 4	Snr. 3	Snr. 3	2 Years.	Total.
C. E. Sherwood, P.O. Box 53, Davel, Tvl.	6,873·1	3·666	251·978	289	11	5	3	3	8	4	34
A. Finnemore, The Beacon, Theunissen, O.F.S.	7,457·6	3·331	248·443	280	1	2	1	—	1	—	5
O. H. Kiessig, Hartmanshoop, Philippolis, O.F.S.	6,698·2	3·684	246·750	265	—	—	1	—	5	5	11
O. W. Vice, Wynnedale, Molteno, C.P.	6,439·2	3·813	245·505	291	2	1	3	—	—	1	7
R. J. Judd, P.O. Box 27, Springs, Tvl.	7,630·6	3·186	243·088	284	10	1	3	1	5	9	29
W. Pretorius, Hoëveld Boerdery, Lynchfield, O.F.S.	7,259·0	3·335	242·112	284	20	1	—	1	1	—	23
Dr. C. M. Rautenbach, P.O. Box 43, Bloemfontein, O.F.S.	7,145·1	3·380	241·503	293	7	1	—	—	—	—	8
J. A. Rautenbach and Co., Eden, P.O. Box 142, Kroonstad, O.F.S.	6,507·3	3·570	232·308	290	16	4	9	9	2	9	49
F. Hellberg, P.O. Box 7, Glencoe, Natal	6,630·7	3·501	232·173	261	4	1	—	—	—	5	10
Harold Blore, Rivenhill, Ficksburg, O.F.S.	6,936·0	3·293	228·410	247	2	3	1	4	2	3	15
P. H. Viljoen, Geluk, P.O. Box 106, Clocolan, O.F.S.	6,501·6	3·444	223·930	284	2	1	2	—	1	1	7
D. Finnemore, Koppieskraal, Theunissen, O.F.S.	6,326·0	3·453	218·437	258	4	1	3	1	3	1	13
J. P. Beket, Erfdeel, Lindley, O.F.S.	6,232·4	3·456	215·420	265	5	—	4	4	5	2	20
Industrial School, Heidelburg, Tvl.	5,889·6	3·622	213·311	278	3	3	—	2	—	1	9
Sieberhagen Bros., Woodford, Mortimer Station, C.P.	5,668·0	3·662	207·567	273	2	—	1	2	3	4	12
M. A. Basson, Oudepost, Darling, C.P.	6,293·4	3·097	194·903	220	—	3	2	1	—	1	7
A. B. Lombard, Omega, Clocolan, O.F.S.	4,968·3	3·618	179·764	280	—	1	2	—	—	2	5
Miss T. Vigne, P.O. Box 107, Kimberley, C.P.	5,366·7	3·206	172·069	230	7	1	1	2	2	—	13
L. C. Serfontein, Geduld, Bosrand, O.F.S.	4,939·8	3·380	166·942	277	11	3	3	1	2	1	21
SHORTHORN HERDS.											
R. L. Kemp, Langverwacht, Waku, C.P.	9,179·5	4·409	404·722	300	5	—	—	—	—	—	5
H. T. C. Sills, Jnr., Sudbrook, Dordrecht, C.P.	9,363·0	4·178	391·213	299	4	—	—	—	3	6	13
R. Trollip and Son, Mount Prospect, Witmoss, C.P.	8,785·1	3·630	318·908	300	1	—	2	3	—	1	7
T. C. Goosen and Son, Haslop Manor, Waverley, C.P.	7,463·7	3·961	295·654	294	7	1	3	1	1	7	20
H. T. Sills and Son, Carlton, Dordrecht, C.P.	7,388·9	3·958	292·437	296	8	—	2	—	3	7	20
T. J. Lake, Sea View, P. B. Barkly Bridge, C.P.	7,655·0	3·746	286·733	300	1	—	—	1	—	4	6
J. H. Diesel, Floradale, P.O. Box 161, Bloemfontein, O.F.S.	6,590·6	3·987	262·797	285	11	2	1	2	2	6	24
Baynesfield Estate, Nels Rust, Natal	6,624·7	3·847	254·828	300	—	1	1	—	2	1	5
C. W. Hardie, Lauriston, New England, C.P.	6,088·8	4·154	252·917	274	7	1	—	—	—	—	8
King Bros., Primeston, Bedford, C.P.	6,006·2	4·088	245·507	275	6	2	3	2	2	4	19
R. W. C. Whitehead, Lucia, P.O. Box 235, Bethlehem, O.F.S.	5,704·7	4·195	239·300	284	6	2	2	—	—	1	11
E. D. Matthews, Tukulu, Alice, C.P.	5,483·0	4·008	219·781	240	3	—	1	1	1	1	7
W. Taylor, Broedersrust, Bainsvlei, Bloemfontein, O.F.S.	5,515·8	3·947	217·685	281	3	—	1	2	1	1	8
W. Minnaar, P.O. Box 22, Bethulie, O.F.S.	5,598·4	3·617	202·519	291	6	—	2	1	2	8	19
P. J. de Wet, Grootschuur, Sterkstroom, C.P.	4,880·4	3·918	191·205	242	3	1	3	1	—	5	13
E. W. Halse, Carnarvon, Halseton, C.P.	4,792·4	3·892	186·509	224	6	1	—	—	—	3	10
H. E. Matthews, Woodstock, P.O. Box 14, Alice, C.P.	4,729·3	3·760	177·809	250	3	—	—	—	—	3	6
Dr. C. Owen Snow, Vaalbosknop, P.O. Alettasrust, Vryburg, C.P.	4,403·6	4·012	176·867	205	2	—	1	1	—	3	7
L. B. Broster, P.B. Broughton, Molteno, C.P.	4,132·9	3·844	158·867	199	5	—	1	—	—	2	8
S. R. Brunette, Milton, Queenstown, C.P.	3,584·1	4·413	158·177	237	1	—	2	1	—	1	5
JERSEY HERDS.											
Grootfontein College of Agriculture, Middelburg, C.P.	8,261·3	5·495	453·954	298	4	1	3	—	1	6	15
Marsh Memorial Homes, Rondebosch, C.P.	8,571·9	4·895	419·620	294	3	1	—	1	—	3	8
A. W. Boss, Vrederust, P.O. Box 2407, Cape Town, C.P.	7,854·9	5·228	410·616	296	2	—	—	2	2	2	8

H. L. D. Wood, Jersey Farm, Retreat, C.P.	8,132·8	4·832	392·995	293	11	2	5	1	2	9	30
Wright Bros., Westoe, Highlands, C.P.	7,745·4	5·046	390·845	299	4	—	—	3	4	4	15
A. Luckhoff, Zuurplaats, Graaff-Reinet, C.P.	7,235·5	5·355	387·468	297	1	1	1	—	1	5	9
S. Hugo, Rust-en-Werk, Daljosaphat, C.P.	8,701·1	4·441	386·405	285	5	2	5	3	1	—	16
Willowtree Jerseys (Pty.), Ltd., Addo, C.P.	6,994·1	5·505	385·051	290	7	3	3	—	6	8	27
J. Nell-Boss, The Meadows, Hankey, C.P.	7,164·7	5·200	372·596	300	12	—	—	3	1	7	23
G. Vernon Crookes, Moyeni, Renishaw, Natal	6,807·6	5·453	371·235	299	17	1	4	3	6	17	48
Stellenbosch-Elsenburg College of Agriculture, Muldersvlei, C.P.	6,334·6	5·648	357·765	295	1	—	—	—	—	5	6
R. Porritt, Kirkwood Stud Jersey Farm, 217 Alexandra Road, Pietermaritzburg, Natal	7,306·7	4·890	357·310	295	1	—	—	—	1	4	6
A. Nicholson, Schoongezicht, Stellenbosch, C.P.	7,214·3	4·865	350·963	295	4	1	—	1	1	1	8
E. Mills, Hillside, Sidbury, Sandflats, C.P.	6,778·0	5·112	346·503	299	7	—	1	—	1	3	12
H. F. Malcomess, Wolseley Estate, Berlin, C.P.	6,351·8	5·410	343·655	260	3	3	—	—	1	—	7
W. P. Sprigg and Son, Whiteheath, Martindale, C.P.	5,906·9	5·314	313·885	276	6	—	—	—	1	2	9
Oakdale Agricultural Training School, Riversdale, C.P.	5,903·9	5·152	304·146	292	6	2	3	1	—	6	18
A. C. Jolly, Thorneycroft, Sevenfountains, C.P.	5,927·8	5·017	297·301	289	4	—	—	1	2	6	13
G. R. Hugo, Salomonsvlei, Klein Drakenstein, C.P.	6,259·6	4·665	292·035	296	3	—	1	—	—	4	8
Redfern Jerseys, Hartford, P.O. Box 31, Mooi River, Natal	6,009·7	4·810	289·092	274	2	—	1	—	1	3	7
Mrs. B. H. V. Handley, Normanby, P.B. Maritzburg, Natal	4,611·5	5·914	272·729	294	—	—	—	1	2	2	5
F. Dammann, P.O. Box 39, Glencoe, Natal	5,014·0	5·435	272·501	264	2	2	—	—	—	1	5
M. Hodgson, 17 Egerton Road, Kimberley, C.P.	5,383·1	4·974	267·773	295	8	—	—	—	—	2	10
H. Nourse, Dwarsvlei, Middelburg, C.P.	4,990·1	5·366	267·770	293	11	—	—	—	5	1	17
Mrs. J. W. Wright, Bowden Hall, Middelburg, C.P.	4,497·9	5·813	261·441	267	1	2	—	1	—	7	11
R. R. Fowlds, Meadowfield, Sandflats, C.P.	5,272·8	4·638	244·577	263	4	—	3	—	—	1	8
H. F. C. Kusel, Honey Grove, Harburg, Natal	4,949·4	4·820	238·572	300	—	—	2	4	1	2	9
A. J. Versfeld, Groote Post, Darling, C.P.	4,748·6	4·909	233·134	247	9	3	3	3	2	8	28
Miss E. I. Newdigate, Portland, Highway, Knysna, C.P.	3,822·1	4·480	171·234	238	3	2	1	—	—	3	9
AYRSHIRE HERDS.											
H. H. McCabe, Riverdale, Graaff Reinet, C.P.	10,519·2	3·685	387·665	292	8	1	—	1	1	3	14
D. S. Fowler, Umgeni Poort, Nottingham Road, Natal	9,092·1	3·802	345·695	300	9	1	—	1	2	3	16
A. C. Donian, Reserve Dairy, Kingwilliamstown, C.P.	7,803·9	3·929	306·624	299	1	1	—	3	1	1	7
Cape Explosives Works, Ltd., Somerset West, C.P.	7,779·3	3·459	269·104	295	13	3	4	2	3	7	32
Mrs. A. R. Lloyd, Edgehill, Mooi River, Natal	7,120·1	3·763	267·931	294	7	2	1	—	3	—	13
T. G. Hilton-Barber, Coldspring, Grahamstown, C.P.	6,417·4	3·957	253·945	292	—	1	—	1	1	2	5
B. W. Reynolds, Hayfields, Glencoe, Natal	6,083·0	3·965	241·191	288	5	3	1	6	2	1	18
GUERNSEY HERDS.											
L. C. Southey, Shanks, Steynsburg, C.P.	9,087·1	4·621	419·914	300	1	1	2	1	1	2	8
H. J. van Aarde, Delectus, Bainsvlei, Bloemfontein, O.F.S.	8,221·3	4·106	337·547	289	2	1	—	2	—	3	8
H. England, 60 Rosebank Avenue, Durban, Natal	5,312·8	5·223	277·474	263	2	1	—	1	—	1	5
Captain G. A. Stevens, Venture, Halesowen, C.P.	5,406·7	4·728	255·606	219	5	—	—	1	1	3	10
D. Labistour, Umgai Farm, Ifafa, Natal	5,159·7	4·178	215·596	300	2	—	—	2	1	—	5
W. E. Lovemore, P.O. Box 23, Sandflats, C.P.	4,159·4	4·689	195·016	276	3	2	—	—	1	2	8
RED POLL HERDS.											
F. M. Howarth, Sweet Kloof, Alicedale, C.P.	7,772·2	4·025	312·821	294	4	—	1	1	1	1	8
Parker Bros., Melrose, Eastpoort, C.P.	7,882·7	3·532	278·450	297	1	1	2	5	1	—	10
Dohne Experimental Station, Dohne, C.P.	5,480·6	3·978	218·031	295	12	1	1	2	2	2	20
Quin Bros., Bishops Glen, Glen, O.F.S.	5,972·9	3·577	213·673	296	18	1	3	4	3	1	30
Estate late C. W. Champion, Balaclava, Tweespruit, O.F.S.	5,373·3	3·583	192·513	295	3	—	—	—	2	1	6
E. Pringle, Glen Thorn, Adelaide, C.P.	4,479·4	3·980	178·300	190	2	—	1	2	—	1	6

Crops and Markets

A Statistical and Economic Review of South African Agriculture

by

The Division of Economics and Markets

Vol. 20 MAY 1942 No. 237

CONTENTS

Price Review for March, 1942.*

SLAUGHTER CATTLE.—The decline in prices of slaughter cattle which had already set in during January continued throughout March, and on the Johannesburg market, especially, notably sharp decreases were recorded, e.g., ordinary prices from 53s. 4d. per 100 lb. estimated dressed weight *on the hoof* in February to 47s. 10d. in March; good mediums from 49s. 2d. to 44s. 3d., and compounds from 40s. 6d. to 36s. 11d. On the Durban market the fall in prices was less sharp, e.g., for mediums from 38s. 11d. per 100 lb. dressed weight *on the hook* in February to 37s. 8d. in March, while compounds even advanced slightly, viz., from 26s. 7d. to 27s. 11d. However, in spite of this drop in prices of nearly all classes of beef cattle, prices were were still on an appreciably higher level than those of the corresponding month for the previous year.

Slaughter Sheep.—In contrast with slaughter cattle, prices of all classes of sheep rose appreciably and a record level was reached, e.g., prime merino hamels on the Johannesburg market as well as on the Cape Town market realized 9·6d. per lb. estimated dressed weight as against 9·3d. and 9d. per lb. respectively the previous month.

Pigs.—Prices of porkers and baconers on Johannesburg market also advanced slightly during the month, viz., prime porkers from 5·4d. per lb. live weight to 5·5d. in March, and prime baconers from 8d. to 8·2d. (See also special article on "The Pig Industry in the Union" elsewhere in this section.)

Maize.—As was announced in the previous issue, only the Maize Control Board now buys maize from producers at 10s. 6d. per bag and 9s. 5d. per 200 lb. *ex* elevators, free-on-rail, for grades 2 and 6.

Kaffircorn.—For the first time since August last, prices of kaffircorn declined somewhat, viz., from 21s. 11d. and 22s. 11d. per bag free-on-rail for K1 and K2 in February to 20s. 2d. and 21s. 1d. respectively in March.

* All prices mentioned are averages.

Hay.—The general shortage of all kinds of feeds and the small offerings of good quality hay caused hay prices again to rise, viz., Cape lucerne on Johannesburg market fro m4s. 11d. per 100 lb. to 5s. 4d. in March, Transvaal lucerne from 4s. 8d. to 4s. 11d., and teff hay from 4s. 4d. to 5s. 6d., while lucerne meal was quoted at 8s. 6d. per 100 lb. free-on-rail Johannesburg as against 7s. 6d. in February.

Potatoes.—While supplies of Cape potatoes were rapidly dwindling on all markets, larger supplies from Transvaal and O.F.S. were forthcoming, especially as from the last week of the month. The quality was, however, in general poorer than usual. Nevertheless nearly everywhere somewhat higher prices than the previous month were realized as a result of the strong demand. Thus Tvl. No. 1 on Johannesburg market rose from 15s. 9d. per bag in February to 16s. 6d. in March, N.M. Grade 1, No. 2 from 20s. 11d. to 21s. 4d., No. 3 from 20s. 5d. to 21s. 7d., Cape No. 1 on Cape Town market from 16s. 3d. to 18s. 4d., and Natal No. 1 on the Durban market from 20s. 3d. tot 21s. 3d. On the East London and Port Elizabeth markets best quality Transvaal potatoes regularly realized the maximum price (25s. per bag).

Onions.—Somewhat larger offerings of onions, of which the quality was poor in some cases, caused onion prices in general to decline slightly, e.g., Transvaal onions on Johannesburg market from 9s. 10d. per bag to 8s. 9d. in March, and Cape onions on the same market from 9s. 9d. to 9s. 5d., while on the Cape Town market Cape onions declined from 7s. to 6s. 7d.

Vegetables.—Very moderate supplies were offered on most markets except in one or two places where local production increased to a reasonable extent as a result of good rains, e.g., on the Bloemfontein and Port Elizabeth markets. For the rest it appears that production has not yet recovered from the consequences of the recent drought, and prices were everywhere maintained on a high level. Tomatoes were also relatively scarce, although the lowveld crop started to appear on some markets as from about the middle of the month.

Fruit.—Deciduous fruit consisted mainly of apples, grapes and, to a lesser extent, of pears, while peaches were very scarce. Prices of apples and grapes were on the whole lower than for the previous month, but were nevertheless satisfactory. Offerings of guavas, avocadoes and pineapples were plentiful, these being in season now. Bananas remained moderate. Offerings of citrus fruit from Transvaal gradually increased during the month, but supplies were still scarce and sometimes green and unattractive. Excellent prices were, however, realized in most cases, e.g., navel oranges were 3s. 7d. per pocket on the Johannesburg market, 6s. 4d. on the Cape Town market and 4s. 3d. on the Durban market.

Eggs were exceptionally scarce during the month, consequently prices advanced still further, viz., for new laid on the Johannesburg market from 1s. 9d. per dozen in February to 2s. in March, and from 2s to 2s. 6d. on the Durban market.

Index of Prices of Field Crops and Animal Products.—The combined index hereof, as shown elsewhere in this section, remained unchanged for March as compared with the previous month, viz., at 125 points. The individual groups comprising this combined index, however, do show changes, e.g., summer cereals declined slightly from 132 points in February to 126 points in March, while summer cereals rose 2 points to 140. This latter index has also been amended

in this issue in order to allow for the extra subsidy of 1s. per bag on all grades of wheat which the Wheat Control Board is paying to producers on all wheat delivered since November, i.e., from the commencement of the present season. The rise in prices of lucerne hay and teff hay resulted in the index for hay prices also advancing from 125 to 140; while a rise in potato prices caused the index for " other field crops " to advance from 168 to 175 points. A further rise in the price of eggs also caused an advance in the index for " poultry and poultry products ", viz., from 147 to 168 points. The group " slaughter stock " is the only other group showing a decline for the month, viz., of 6 points, from 140 to 134, caused by the decline in the price of slaughter cattle.

Review of Groundnut Industry.

THE present groundnut crop (i.e., 1941-42) is roughly estimated to be only 50 per cent. of that of the previous season, which was estimated at approximately 172,000 bags of 100 lb. unshelled nuts produced on European farms; while the 1939-40 crop was estimated to be approximately 213,000 bags.

As the Union has never been able to supply its own demands of groundnuts, and supplies had, therefore, to be imported each year, the shortage this year with the present small crop expected, will be even more pronounced. For the past couple of years an agreement was entered into each year between producers and oil expressors, whereby the latter undertook to buy from producers, at a fixed price, the available quantities for oil expressing purposes, the balance going to the local trade for edible consumption. The quantities imported annually and delivered locally for oil expressing purposes, together with the price agreed upon in each case for the latter, is given in the table below:—

	Quantities Imported.	Quantities Delivered Locally.	Price per 100 lb. Shelled.
	tons.	tons.	s. d.
1935	12,400	2,200	13 3
1936	17,900	1,300	14 0
1937	20,600	4,270	16 0
1938	28,000	3,944	16 0
1939	29,600	5,028	15 6
1940	30,500	4,500	18 0
1941	(not available)	2,614	20 0

In view of the fact that the Union has now lost important sources of oil-containing seeds in the East, it has become absolutely necessary to extend our own production as much as possible during the next season apart from the fact that other sources of supply will also have to be explored. It is essential, therefore, that sufficient quantities of the present crop be retained for seed purposes, and the Government (Controller of Food Supplies) has accordingly decided to purchase the whole of the existing crop.

As a result of the small crop, producers will receive the relative high price of 20s. per 100 lb. free-on-rail, sellers' station, for unshelled nuts with a nutritive value of 60 per cent., with corresponding prices for other grades. This price means approximately £3. 6s. per bag of 200 lb. shelled nuts.

The Pig Industry in the Union.

IN the table below some statistical details in connection with the pig industry in the Union are given:—

	Numbers (European only).	Slaughterings in Abattoirs. *	Factory Production of Bacon and Ham. 1,000 lb.	Index of Prices of Pigs. †	Purchasing Power of Pig Prices.
1926–27	444,662	222,000	7,011	111	90
1927–28	424,803	218,000	7,037	109	91
1928–29	393,388	204,000	7,346	128	109
1929–30	404,790	196,000	7,678	120	111
1930–31	†	†	7,675	85	86
1931–32	†	†	6,933	70	74
1932–33	†	218,000	6,455	65	75
1933–34	408,499	194,000	6,823	111	111
1934–35	523,462	221,000	6,984	107	113
1935–36	619,184	272,000	7,601	91	95
1936–37	538,249	275,000	8,042	80	82
1937–38	449,415	291,000	9,528	100	98
1938–39	466,324	287,000	9,495	122	122
1939–40	†	285,000	11,166	111	106
1940–41	†	356,000	†	100	87

* Figures for calendar years.
† Not available.
‡ Index of prices of baconers and porkers on Johannesburg market on basis 1936/37–1938/39 = 100.

From the first 3 columns of the table it appears that:—

(1) The number of European-owned pigs shows a slight upward trend for the past 15 years. The numbers given above, however, probably apply mostly to breeding pigs, as the agricultural census is always taken in September, i.e., at a time when the numbers on farms are low, since slaughterings occur mostly during the winter months.

(2) There is a gradual rise over the years of the number of slaughterings in municipal abattoirs as well as of factory-produced bacon and ham. It also shows that since the outbreak of the war there was a notable increase in the demand for pig products, partly as a result of an increased local consumption and partly because of the fact that large quantities are being consumed by military establishments and considerably increased quantities are at present being taken up as ships' stores.

In spite of this temporary increase, however, the progress in the development of the pig industry in the Union up to now was relatively slow, mainly because we have no established system of pig farming based on the utilization of waste products, but it is more a response to prices. When prices are high, pigs are relatively scarce and farmers begin to breed more pigs, resulting in increased numbers soon coming on the market; prices recede quickly and farmers again become discouraged. The result is that pig production is largely cyclical and that prices also move in cycles. This cycle in pig production is clearly reflected in the numbers of pigs belonging to Europeans, while the cycle in price movements is shown in the last two columns of the above table. The column "purchasing power of

pig prices " shows the relationship between pig prices and prices of other commodities. From this it appears that peaks in the purchasing power of pig prices were reached in the years 1929-30, 1934-35 and again in 1938-39. It also appears that the cycle moves slowly from a low point to a peak and then declines sharply, e.g., from 111 points in 1929-30 to 86 points in 1930-31; from 113 in 1934-35 to 95 in 1935-36 and from 122 in 1938-39 to 106 in 1939-40. It would also appear as if the present cycle has reached its lowest point in 1940-41 and that a rist has probably set in. According to the table of pig prices shown elsewhere in this section a gradual advance in all pig prices on Johannesburg market set in from about June 1941, and prices are now moving on a much higher level than during the previous season. Prices of baconers and porkers, e.g., were 8·2d. and 5·5d. per lb. live weight respectively in March as against 6·1d. and 4·2d. for the corresponding month the previous year.

Seasonal fluctuation in pig prices.—Apart from a cyclical movement, prices of pigs are also subject to a definite annual seasonal fluctuation, as appears from the following table, giving the average index of pig prices on Johannesburg market for each month for the eight-year period 1933-34 to 1940-41:—

July.	*August.*	*September.*	*October.*	*November.*	*December.*
94	92	94	100	106	105
January.	*February.*	*March.*	*April.*	*May.*	*June.*
106	107	104	101	94	94

Prices were highest during the months November to March when supplies were light; and low during the winter months May to August when supplies were heavy owing to the fact that most slaughterings occur during this time.

Average Prices of Potatoes and Onions on Municipal Markets.

SEASON (1st July to 30th June).	POTATOES (150 lb.).						ONIONS (120 lb.).		
	Johannesburg.				Cape Town.	Durban.	Johannesburg.	Johannesburg.	Cape Town.
	Transvaal. No. 1.	Transvaal No. 2.	N.M. Grade 1. No. 2.	N.M. Grade 1. No. 3.	Cape No. 1.	Natal No. 1.	Transvaal.	Cape.	Cape.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
1938–39	6 9	6 2	8 10	8 1	8 3	8 10	8 3	8 10	7 4
1940–41	14 2	13 4	18 6	18 5	15 7	16 10	12 5	12 3	9 10
1941—									
January	11 4	10 1	12 4	11 7	10 2	14 4	7 3	7 3	4 7
February	8 9	8 2	12 1	11 9	14 2	11 0	6 9	7 4	4 10
March	10 10	10 7	13 9	13 8	13 0	13 5	8 1	8 10	5 4
April	14 8	14 10	19 9	19 0	19 4	17 11	8 11	9 9	7 8
May	15 3	14 4	21 1	20 11	16 9	17 11	9 9	10 3	7 6
June	17 9	17 10	22 10	22 7	18 2	21 4	10 8	13 2	9 5
July	22 9	23 5	28 0	28 5	26 8	27 6	16 1	16 1	12 11
August	18 10	19 10	26 10	27 2	24 8	24 9	13 0	19 0	15 3
September	19 2	20 1	25 1	24 8	28 0	26 7	17 1	16 9	13 9
October	26 0	24 10	28 8	28 8	33 5	29 8	11 3	17 1	12 11
November	25 0	24 3	34 1	32 11	26 10	29 8	9 1	—	10 1
December	21 5	20 1	22 2	21 11	14 9	24 8	10 3	12 4	8 1
1942—									
January	18 8	16 4	20 6	18 11	15 3	23 2	9 3	10 2	7 10
February	15 9	13 11	20 11	20 5	16 3	20 3	9 10	9 9	7 0
March	16 6	15 2	21 4	21 7	18 4	21 3	8 9	9 5	6 7

Index of Prices of Field Crops and Animal Products.

(Basic period 1936-37 to 1938-39=100.)

SEASON (1st July to 30th June).	Summer Cereals, (a)	Winter Cereals. (b)	Hay. (c)	Other Field Crops. (d)	Pastoral Products. (e)	Dairy Products. (f)	Slaughter Stock. (g)	Poultry and Poultry Products. (h)	Combined Index.
WEIGHTS.	19	13	2	3	34	6	17	6	100
1936–37	118	86	94	93	122	86	89	98	106
1937–38	89	106	112	118	98	112	105	107	101
1938–39	92	107	96	89	79	102	106	94	93
1939–40	86	106	77	93	116	105	106	89	104
1940–41	109	113	106	159	103	108	110	112	109
1941–									
January	121	115	98	121	100	104	115	96	109
February	122	115	92	115	100	104	112	107	109
March	135	115	87	125	100	104	105	125	112
April	126	116	98	167	101	106	108	151	114
May	112	116	125	160	101	109	108	157	112
June	110	116	126	183	101	111	111	150	113
July	112	118	128	241	100	130	118	145	117
August	111	118	132	216	100	130	119	109	114
September	118	118	154	228	100	130	128	108	118
October	124	119	138	268	100	128	135	115	121
November	124	137	110	250	100	128	140	118	124
December	127	137	135	199	100	122	147	128	125
1942—									
Jan.	131	137	126	180	100	122	144	141	125
Feb.	132	138	125	168	101	130	140	147	125
March	126	140	140	175	101	130	134	168	125

(a) Maize and kaffircorn.
(b) Wheat, oats and rye.
(c) Lucerne and teff hay.
(d) Potatoes, sweet potatoes, onions and dried beans.
(e) Wool, mohair, hides and skins
(f) Butterfat, cheese milk and condensing milk.
(g) Cattle, sheep and pigs.
(h) Fowls, turkeys and eggs.

Average Prices of Lucerne and Teff Hay and Certain Meals for Feeding.

SEASON (1st July–30st June).	LUCERNE (100 lb.). Johannesburg (a). Cape	Trans-vaal	Cape Town, Cape 1st Grade.	TEFF Johannesburg. (a) (100 lb.),	MEALS FOR FEEDING: F.o.r. Johannesburg. Lucerne. (100 lb.).	Monkey Nut Cake (200 lb.).	Oats, Sussex Ground (150 lb.).	Bone, 24·8% Protein (100 lb.).	Mixed, 26·4% Protein (100 lb.). (b)
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
1938–39	3 11	3 1	4 0	2 7	6 9	15 2	15 4	8 5	8 0
1940–41	4 2	3 5	4 3	3 3	6 7	15 3	14 8	11 2	8 7
1941—									
January	3 9	3 2	4 0	3 9	6 6	15 0	14 6	11 0	8 6
February	3 9	2 8	4 1	2 8	6 6	14 6	14 0	11 0	8 6
March	3 6	3 0	4 5	2 7	6 6	14 0	14 0	11 0	8 6
April	4 0	3 11	5 0	2 10	6 6	14 6	14 0	11 0	8 6
May	5 3	3 10	5 0	2 10	6 9	14 6	14 6	11 0	8 6
June	5 3	4 9	5 5	3 1	7 0	15 6	15 0	11 0	9 6
July	5 2	5 2	5 10	3 10	7 6	15 6	16 0	11 0	9 6
August	5 6	6 3	5 11	3 3	8 0	—	17 0	11 0	9 6
September	6 5	6 1	5 7	3 9	8 6	16 0	17 6	11 0	9 6
October	5 8	5 8	5 1	3 10	8 6	—	17 6	11 0	9 6
November	4 5	3 11	4 11	3 6	8 6	—	—	11 0	9 6
December	5 3	4 10	4 9	4 10	7 6	—	17 6	10 6	9 6
1942—									
January	4 10	4 7	5 1	4 11	7 6	—	17 6	10 6	10 8
February	4 11	4 8	5 5	4 4	7 6	—	17 6	10 6	10 8
March	5 4	4 11	5 7	5 6	8 6	—	17 6	11 0	10 8

(a) Municipal Market. (b) Approximately half of the protein is claimed to be animal protein.

Average Prices of Eggs on Municipal Markets and Prices of Hides and Skins.

Season. (1st July to 30th June).	Eggs.				Hides (per lb.).		Skins.		
	Johannesburg.		Cape Town, per 100.	Durban New Laid, per dozen.	Port Elizabeth.		Port Elizabeth.		
	New Laid, per dozen.	Fresh, per dozen.			1st Grade, Sun-dried.	1st Grade, Dry Salted.	Merino.		Glovers, Sound, per lb.
							Medium, per lb.	Combings, per lb.	
	s. d.	s. d.	s. d.	s. d.	d.	d.	d.	d.	s. d.
1938–39	1 0	0 9	7 11	1 1	6·0	5·3	4·1	5·7	2 9
1940–41	1 1	0 10	8 3	1 3	5·8	6·0	4·9	7·6	2 10
1940—									
November	0 10	0 8	7 2	1 0	6·1	5·9	5·0	7·0	2 7
December	1 1	0 10	8 2	1 4	6·2	6·2	5·4	7·4	3 0
1941—									
January	1 1	0 9	9 3	1 3	5·9	6·3	4·7	7·3	3 1
February	1 4	1 0	9 2	1 7	5·7	5·9	4·4	8·2	3 1
March	1 8	1 3	11 10	1 10	5·4	5·8	5·0	8·9	3 2
April	2 1	1 7	13 8	2 6	6·3	6·9	6·2	9·1	3 5
May	1 11	1 6	15 8	2 7	6·5	6·8	6·3	8·7	4 0
June	1 8	1 5	14 9	2 0	6·5	6·8	6·1	8·6	4 3
July	1 6	1 4	14 0	1 10	6·3	6·8	4·3	7·8	4 2
August	1 0	0 11	8 9	1 1	6·5	6·6	4·4	8·0	4 2
September	1 0	0 11	8 5	1 1	6·5	6·8	4·4	8·1	4 1
October	1 0	0 11	8 10	1 2	6·8	7·0	3·8	7·7	4 0
November	1 1	1 0	9 1	1 4	7·0	7·1	4·3	7·7	4 1
December	1 5	1 2	9 10	1 9	7·3	7·3	4·0	7·8	4 2
1942—									
January	1 7	1 4	12 2	2 0	7·5	7·6	4·3	7·9	4 0
February	1 9	1 6	13 1	2 0	7·7	7·8	5·7	8·5	3 0
March	2 0	1 9	14 5	2 6	7·6	7·6	6·4	9·2	3 11

Average Prices of Apples, Pears and Grapes on Municipal Markets.

Season (1st July to 30th June).	Apples (Bushel box).						Pears (Bushel box).		Grapes (Tray).
	Johannesburg.			Cape Town.			Johannesburg.		Johannesburg.
	O'henimuri.	White Winter Pearmain.	Wemmershoek.	O'henimuri.	White Winter Pearmain.	Wemmershoek.	N.M. No. 1.	Other.	Johannesburg.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
1938–39	7 2	6 0	5 10	7 3	8 0	4 3	6 7	4 2	1 3
1940–41	8 4	7 1	6 4	8 11	10 8	5 7	8 11	6 3	1 8
1941—									
January	—	—	—	8 5	—	—	7 0	5 8	1 7
February	—	—	—	7 11	10 6	4 5	9 0	6 9	1 6
March	6 8	5 11	5 7	6 9	7 3	5 2	9 0	6 2	1 10
April	6 9	6 4	6 1	7 6	7 11	5 7	6 3	6 5	1 11
May	7 5	6 3	6 10	8 3	7 10	5 9	8 1	5 11	2 0
June	8 3	7 8	8 4	9 11	9 10	6 9	—	9 5	1 2
July	8 2	7 2	8 5	11 3	11 4	12 6	10 7	7 5	—
August	8 4	8 1	7 3	11 0	11 0	11 8	—	11 1	—
September	11 8	9 1	8 3	10 9	12 10	—	—	—	—
October	10 8	9 0	6 10	10 6	13 5	—	—	—	—
November	16 0	13 0	—	8 5	13 8	—	—	—	—
December	—	—	—	—	16 5	—	—	5 10	3 8
1942—									
January	—	—	—	—	—	—	—	7 5	3 2
February	8 3	—	12 2	8 10	—	—	7 3	7 8	1 6
March	7 5	6 11	7 6	7 7	9 3	6 3	5 6	7 0	1 10

Average Prices of Slaughter Cattle and Pigs.

Season (1st June to 31st May).	Beef per 100 lb. (a) Johannesburg. N.M. Prime.	Beef per 100 lb. (a) Johannesburg. Ordinary. Prime.	Beef per 100 lb. (a) Johannesburg. Good Medium.	Beef per 100 lb. (a) Johannesburg. Com-pounds.	Beef per 100 lb. (b) Durban. Medium.	Beef per 100 lb. (b) Durban. Com-pound.	Pigs per lb. Live Weight. Johannesburg. Porkers, Prime.	Pigs per lb. Live Weight. Johannesburg. Baconers, Prime.	Pigs per lb. Live Weight. Johannesburg. Stores.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	d.	d.	d.
1938–39	41 9	39 0	36 3	31 7	33 0	27 4	5·3	6·2	4·9
1940–41	43 11	41 4	37 11	32 5	31 1	25 4	4·5	5·4	4·0
1941—									
January	45 7	42 11	39 6	34 7	32 2	27 7	4·8	5·7	4·0
February	45 0	41 2	38 1	32 9	29 11	24 5	4·3	6·2	4·1
March	40 6	38 3	35 5	29 7	27 11	21 4	4·2	6·1	3·6
April	42 4	39 10	36 3	30 1	29 10	25 5	4·2	5·6	3·8
May	44 6	40 8	36 10	30 9	29 4	22 1	4·2	5·6	3·9
June	43 9	41 2	37 6	32 8	32 2	25 9	4·3	5·4	3·7
July	46 5	44 5	39 10	33 5	34 6	29 11	4·6	5·6	4·0
August	47 0	44 9	41 2	33 7	35 5	29 3	4·5	5·6	3·5
September	49 11	47 1	44 2	36 11	41 9	33 11	4·8	5·6	3·7
October	56 5	53 6	50 1	44 11	46 1	34 8	5·0	5·6	4·2
November	68 4	63 2	55 5	42 8	51 4	36 4	5·5	6·2	4·8
December	72 2	68 7	60 3	43 0	49 2	33 6	5·4	6·4	4·9
1942—									
January	63 2	59 6	54 1	43 5	45 1	29 3	5·6	7·0	5·6
February	58 3	53 4	49 2	40 6	38 11	26 7	5·4	8·0	5·2
March	53 5	47 10	44 3	36 11	37 8	27 11	5·5	8 2	4·8

(a) Estimated dressed weight of cattle as sold on the hoof. As reported by Meat Control Board.
(b) Dressed weight of carcase sold on the hook.

Average Prices of Sheep per lb. Estimated Dressed Weight.*

Season (1st June to 31st May).	Johannesburg. Merino Wethers. Prime.	Johannesburg. Merino Wethers. Medium.	Johannesburg. Persians and Cross Breds. Prime.	Johannesburg. Persians and Cross Breds. Medium.	Cape Town. Merinos. Prime.	Cape Town. Merinos. Medium.	Cape Town. Capes and Persians. Prime.	Cape Town. Capes and Persians. Medium.
	d.	d.	d.	d.	d.	d.	d.	d.
1938–39	6·3	5·5	5·8	5·1	5·8	5·6	5·9	5·7
1940–41	6·7	6·1	6·2	5·7	6·1	5·8	6·3	6·0
1941—								
January	7·0	6·5	6·5	6·0	6·3	6·1	6·4	6·1
February	7·1	6·6	6·7	6·2	6·9	6·5	6·8	6·5
March	6·7	6·1	6·2	5·7	6·3	5·9	6·2	5·9
April	7·0	6·5	6·4	5·9	6·6	6·1	6·4	6·1
May	7·1	6·5	6·6	6·0	6·0	5·8	6·3	6·0
June	7·1	6·6	6·6	6·1	6·3	5·9	6·5	6·2
July	7·7	7·0	7·2	6·6	7·0	6·7	6·9	6·6
August	7·6	7·0	7·1	6·5	7·1	6·7	6·8	6·6
September	8·2	7·6	7·7	7·0	7·2	6·8	7·2	6·9
October	7·4	6·7	7·0	6·3	6·6	6·4	6·8	6·6
November	7·4	6·8	6·9	6·3	6·8	6·5	6·9	6·6
December	8·2	7·4	7·6	6·8	6·8	6·5	6·8	6·5
1942—								
January	8·7	7·8	7·5	6·7	7·4	7·1	7·4	7·2
February	9·3	8·3	8·2	7·7	9·0	8·3	8·7	8·3
March	9·6	8·4	8·8	7·9	9·6	8·8	9·3	8·8

* As sold on the hoof. Reported by Meat Control Board.

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Editorial:

Food for the Nation.

THE great drought of the past summer has been responsible for a serious decline in food production throughout the Union, with the result that a food scarcity is threatening. This scarcity may develop into a shortage of certain products if steps are not taken immediately to prevent it. A general food shortage would be a calamity, and it is therefore the duty of every citizen to co-operate in order to supply the nation's food requirements. This can be done if farmers will produce more and consumers take steps to prevent all waste. Both producers and consumers—everybody therefore—can assist in keeping our national larder stocked. Here is a form of national service in which every person can participate.

The Minister of Agriculture and Forestry has been appointed Food Controller, and he has created an organization, headed by the Secretary for Agriculture and Forestry, with a view to stimulating food production. It is his task not only to ensure that more food is produced but also to regulate supplies and to arrange proper marketing and equitable distribution.

The production section is faced with a tremendous task, because it wants to help producers to obtain the necessary farm requisites in spite of the inadequate shipping space available for imports. Where supplies or requisites are short, steps will be taken to assist producers of foodstuffs in obtaining their farm requisites.

Attempts are now being made to organize producers in such a way that they will be able to inform the Food Controller in good time of their essential requirements. At the same time, information and advice will be given to producers by the Food Control Organization.

The normal supplies of fertilizers, spray materials, spare parts, etc., will probably not be available in adequate quantities. Our farmers will have to use all manner of articles with which they are not familiar, but the Food Controller is taking steps to give them the best technical advice in regard to the use of such articles.

The great task of the Food Controller will make tremendous demands on those charged with its execution, and both producers and consumers must therefore give every assistance in their power to achieve our common aim—ample food for the nation.

Dr. J. S. Marais, Director of Publicity: Food Control.

Mr. M. J. A. Joubert.

MR. M. J. A. JOUBERT, Under-Secretary for Agriculture and Forestry, retired on pension from the permanent service of the Department on 4 May 1942 on reaching the age limit.

In 1905, Mr. Joubert entered the service of the Administration of the Orange River Colony as assistant agronomist in the Division of Crop Production. In 1906 he went to Canada to continue his studies and in 1909 he obtained the B.S.A. degree. On his return to South Africa, he became Travelling Instructor in Agriculture in the O.F.S. In 1913 he was appointed Principal of the newly established School of Agriculture at Glen, and in 1924 he was transferred in the same capacity, to the School of Agriculture, Grootfontein, Middelburg, Cape, whence in 1929 he came to Pretoria as assistant chief of the then Division of Plant Industry. In June 1932 Mr. Joubert became the chief of the Division of Agricultural Education and Extension, and in 1933 he was appointed Under-Secretary for Agriculture. During the past nine years he contributed in large measure to the consolidation of the large and extensive administration of the Department of Agriculture and Forestry.

Although Mr. Joubert has retired on pension, he will remain in the part-time service of the Department as Technical Advisor. He also retains the posts of Chairman of the S.A. Wool Council and Chairman of the Wool Marketing Committee.

Improvement of Farming Practices.

CO-OPERATIVE demonstrations are being carried out by extension officers and other officers of the Division of Animal and Crop Production, in collaboration with farmers, with a view to the general improvement of farming practices. The object of these experiments is primarily to demonstrate in a practical manner and on practical farms certain improved methods of farming. The work which is being done on experiment farms and at other Government institutions is sometimes viewed with some suspicion on the part of farmers, because they have no faith in the financial aspect of those projects which, naturally, are conducted with state funds. When the demonstration is carried out by a practical farmer, however, and the beneficial effects of an improved method of farming are confirmed by the farmer actually taking part in the scheme, his efforts sometimes have revolutionary results. One of the results, for example, of co-operative demonstrations is the wide-spread cultivation of certain crops in areas where only a short while ago they were altogether unknown. Numerous other striking proofs of the benefits derived from co-operative demonstrations could be quoted.

These demonstrations are also undertaken, however, in order to collect certain data for the Department of Agriculture and Forestry. In such cases they are regarded rather as experiments, the object being to obtain information in respect of the adaptability of certain crops or farming practices to particular climatic conditions and soil types. These demonstrations therefore present officers of the Department with an excellent opportunity of improving their knowledge of regional conditions, which is a matter of the greatest importance

if farmers are to be given the best possible advice. Consequently, co-operative demonstrations are regarded by the Department as an extremely valuable means of disseminating knowledge and of obtaining information.

Without the willing and capable co-operation of the farmers taking part in the scheme, it would be impossible to carry out the demonstrations. Admittedly, the farmers themselves are the first to enjoy the benefits of the demonstrations conducted on their farms, but the execution of the plan sometimes puts them to considerable inconvenience and expense. Co-operations are therefore rendering a valuable service not only to the Department of Agriculture and Forestry but also to their fellow-farmers. The Department wishes to avail itself of this opportunity of expressing its thanks and appreciation to all collaborators for the competent manner in which they have carried out and are continuing to carry out the demonstrations.

In the past it was the custom of the Department to publish annually a list of co-operative demonstrations as a token of appreciation and also as a means of informing other farmers of what is being done in their neighbourhood. Twelve such lists have already been published. It is, with profound regret, therefore, that the Department must now inform all collaborators and farmers that, owing to the serious paper shortage, the list cannot be published as usual this year. In spite of a reduction in staff, the curtailment of funds and an increase in the price of such commodities as fertilizer and seed, there would this year have appeared in the list of the Division of Animal and Crop Production the names of 633 collaborators with between 700 and 800 different demonstrations.

As in the past, extension officers once again availed themselves of co-operative demonstrations to lay special emphasis on two extremely weak points in our farming system, namely, the failure to made adequate provision for stock feed and the omission of measures designed to protect the soil against erosion and impoverishment. The necessity of having adequate feed reserves was again clearly demonstrated during the severe droughts of the past few seasons. Striking instances are known of farmers who took to heart the lessons taught by co-operative demonstrations and built up sufficient feed reserves, with the result that they suffered no stock losses.

In so far as soil erosion and soil impoverishment are concerned, farmers will have to guard against these evils, especially during the next few seasons. The appeal to farmers to increase production, and the attractive prices obtained for agricultural products, must not become an incentive to practice injudicious methods of cultivation and exploitational cropping with all their harmful consequences.

In addition to the co-operative demonstrations, a great variety of subjects are demonstrated, according to the requirements of the particular area. Farmers are strongly urged to approach their nearest extension officer or College of Agriculture in connection with the addresses of co-operators and the nature of the demonstrations, and to visit these demonstrations in order to acquaint themselves with the results which have already been achieved. The closest co-operation is necessary, especially during the present period of fluctuations, in order to prevent any disturbance in the equilibrium of our farming system.

(K. E. W. Penzhorn, Officer in Charge, Co-operative Demonstrations, Division of Animal and Crop Production.)

Good News for Tomato Growers.

A New Tomato Resistant to Fusarium Wilt Disease.

Dr. J. D. Hofmeyr, Horticulturist, Sub-tropical Horticulture Research Station, Nelspruit.

FUSARIUM wilt disease is one of the most serious diseases with which tomato farmers in the Transvaal lowveld, Natal, and the eastern Cape Province have to contend. The disease is characterized by a wilting and gradual dying back of the plant. The internal tissues also lose their normal green colour and become brownish.

Extensive experiments have been carried out by the writer during the past ten years in an attempt to breed varieties which are completely resistant to this serious disease. A large number of varieties, including such well-known varieties as Marvel, Marglobe, Stone, Norton, Glovel, Rutgers, etc., were imported from America and other countries, but not one of them proved resistant under South African conditions. On the contrary, all of them, without exception, proved to be very susceptible during seasons which were very favourable for the development of the fungus responsible for the disease.

Crossing with Wild Tomato.

Experiments showed that the South American wild tomato, *Lycopersicum pimpinellifolium*, is immune to fusarium wilt disease, and, consequently, scientists at the Missouri Research Station, Columbia, Missouri, U.S.A crossed it with ordinary tomatoes. It was found that the offspring inherited the power of resistance. We were kindly supplied with some of the seed of the above crossings. Our tests showed that the seeds were not yet pure since they showed differences in respect of the shape and size of the fruit and also in regard to their immunity to the disease. Some of the plants were still highly susceptible to the disease while others remained free of it. With the co-operation of Dr. F. C. Loest, the seedlings obtained from the seed of the latter plants were subjected to a severe infection of the disease and it was found that, in contrast with the varieties already mentioned, these selections were completely immune to the disease.

Although these selections do not as yet compare favourably with our best varieties in every respect, they will enable tomato growers, however, to grow tomatoes in future under circumstances where, previously, it was impossible to cultivate them owing to the presence of fusarium wilt disease.

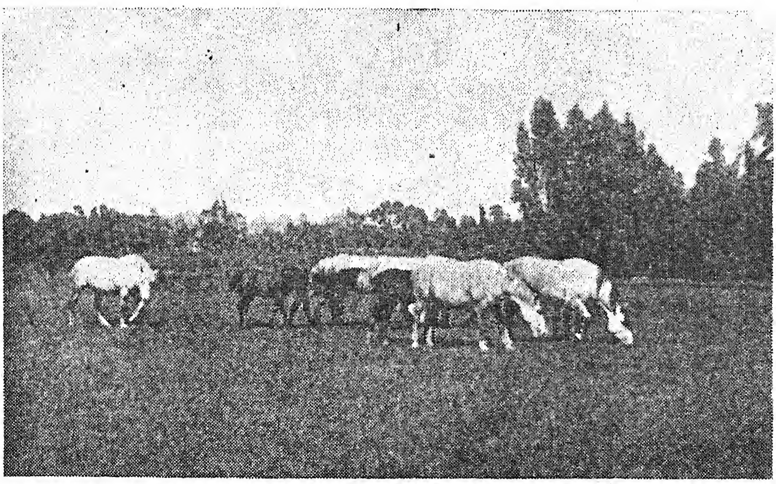
A start has already been made with the crossing of these selections with good tomato varieties with the object of making future selections equal to our best varieties in so far as desirable fruit qualities such as size, shape, quality, etc., are concerned. It is hoped that seed obtained from these crossings will be made available to farmers within two or three years. It should be pointed out, however, that the above-mentioned selections are resistant only to fusarium wilt disease and that they are not less susceptible to bacterial wilt, early blight or other tomato diseases than the ordinary varieties.

In September of this year small quantities of seed will probably be made available to farmers on whose farms fusarium wilt disease seriously hampers the future cultivation af tomatoes.

The Breeding and use of Draught Horses in South Africa.

Dr. P. J. v. d. H. Schreuder, Senior Professional Officer, Division of Animal and Crop Production.

THE importation of draught horses into South Africa on a considerable scale dates back to the eighties of last century when batches of the recognised draught breeds, mainly geldings, were introduced by the transport sections of the municipalities of our larger coastal cities. During the early nineties large numbers of stallions of the then popular carriage and coach-horse breeds—Hackneys, Roadsters, Cleveland Bays, Flemish and other "cart-horse" breeds were imported to furnish heavier teams for the stage-coach service to the newly discovered gold and diamond fields and also for drawing trams in the fast-growing inland and coastal towns.



Purebred Percheron Brood Mares—Grootfontein College of Agriculture.

With the rapid extension of railways and the disorganizing influences of the Anglo-Boer War, the First World War and the introduction of motor vehicles, horse-breeding as a branch of our farming industry suffered a depressing and even deteriorating setback.

Apart from isolated instances, the establishment of studs of draught horse stock dates back to 1910 and subsequent years when the Government established small studs of Clydesdales and later also Percherons at the Colleges of Agriculture.

Owing to the presence of the ox and donkey and the extensive use of motor transport, the horse as a source of tractive power on the farm and for transportation purposes was subjected to an unequal competition against which very little headway could be made. During the last decade or two, however, saner viewpoints gradually began to exert themselves. An increasing number of farmers, as

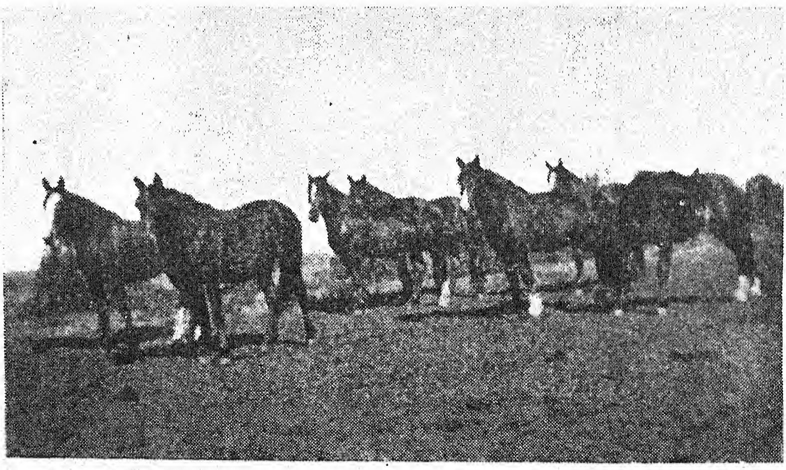
well as industrial and other corporations, began to realize that tractive power in the form of horse and mule teams could perform certain essential services more efficiently and economically than imported mechanised transport using imported fuel.

It is being realized to an ever-increasing extent that South Africa is essentially a livestock country, that in her cradle days she produced horses of exceptional quality and stamina and that in recent years large supplies of surplus crops were produced and had to be subsidised in order to be sold at a profit. A large supply of locally produced feeds and good horses can therefore furnish a very large amount of natural, national, farm and other tractive power.

This commendable interest in an indispensable branch of our livestock-industry is not only increasing, but is making very healthy progress. During the past two decades a large number of high-class breeding animals, amongst which grand champions of overseas shows may be counted, found their way to our studs. Surplus young stallions are eagerly bought, and the demand for teams of draught horses and good breeding stock cannot be satisfied.

Interest Revived.

In spite of the general apathy of the farming public, and the doldrums through which the horse-breeding industry passed during



High-grade Percheron Mares bred in Eastern O.F.S.

the first few decades of the present century, the Government not only maintained its small studs of draught horses, but when interest revived it strengthened its studs by fresh importations and the reorganization of this branch of its operations at the Colleges of Agriculture.

Due mainly to the general apathy which prevailed during the period referred to, the studs of Clydesdales diminshed and deteriorated to such an extent that the Department of Agriculture and Forestry decided to meet the most urgent needs of the country by framing a policy of supporting only two breeds at its Colleges of Agriculture, viz., the Percheron for draught purposes and the Thoroughbred for the breeding of light utility horses. The Department to-day owns some 120 odd stud Percherons, distributed at the Colleges of Agriculture and other Stations where their use is becom-

ing more and more an integral part in the farming operations of the Colleges and where surplus stallions are bred for farmers.

In addition to the Government studs, there are several smaller studs where very good stock is being maintained, while larger concerns owning up to 300 mares are building up a fine strain of heavier horses for farm power.

Type of Horse Needed.

In the past, South African remounts, which were bred mainly from high-class oriental sires and later, after 1820, from Thoroughbred stock, were justly famous on battlefields in foreign countries. As a result of the loss of trade in remounts in 1860, the greatly increasing interest in other branches of farming, such as the breeding of merinos, angoras and ostriches, and the rapid extension of railways and other modes of transportation, horse breeding suffered a serious decline.

In spite of the use of sires of the carriage and coach-horse breeds, the South African horse stock is, in the main, still largely of a light type.

The demand for good general utility light horses is limited, but firm. For the improvement and production of this type, Thoroughbred stallions of ample substance and bone will be the best when mated with selected light mares of good size, quality and bone, as such mating will produce a type approximating the useful Irish hunter type or at any rate produce the type for which South Africa was famed during the latter decades of last century.

The production of a heavier horse suitable for heavy hauling and more sustained farm work is beset with various problems, none of which, however, is unsurmountable, judging by the type of horse produced by old-established enterprises now supplying draught horses to our larger cities and other corporations.

The production of a heavier type of horse is a comparative new phase of livestock farming, and certain adjustments must be made to existing methods in order to produce the right type of horse.

It is of primary importance to realize that in order to be efficient and economical a horse used for tractive power must be properly fed, groomed, managed and handled, and that the preparation of animals intended for heavy haulage must begin on the farm and in the stud.

Young stock and brood mares must be given every opportunity not only to develop their hereditary qualities, but also to attain the size and weight so essential for heavy work. Horse-breeding demands its own routine and approved operative methods, which must be developed and put into practice wherever teams or studs of heavy horses are used.

Choice of Breed.

In choosing a breed one must be guided by results obtained in the use of sires of different draught breeds on selected light horse stock and also by a critical study of breed relationship, adaptability and genetic affinity of hereditary qualities.

The hereditary make-up of a cold-blooded draught stallion differs very widely from that of the average light horse. In fact, there is hardly any affinity or breed relationship between the cold-blooded draught breeds and any of the light-horse breeds. The only exception is the Percheron. In the formative years of this breed much oriental blood was used to produce fast trotting coachers. When the days of stage coach were over and the breed was moulded into

[*Continued on page* 372.

The Occurrence, Characteristics and Function of Manganese in Soil and Plant.

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IN South Africa manganese is one of the trace elements which play an important part in the cultivation of agricultural crops. As soon as a deficiency of available manganese occurs in the soil solution, plants begin to suffer from physiological diseases.

Abnormalities in Plants.

The so-called " grey speck " of oats which occurs almost exclusively on neutral or alkaline soils is a disease caused by a deficinecy of available manganese in the soil. Although it has been found that other crops are also subject to grey speck, this term is used almost exclusively in connection with oats and, possibly, also in the case of wheat and barley. Furthermore, oats may be affected with a bright yellow chlorosis as a result of a manganese deficiency.

Spinach suffering from a manganese deficiency exhibits a chlorosos similar to that found in beet and mangold, but the spots are of a duller greyish-yellow colour. In potatoes the upper leaves of the plant turn a light yellow colour, with dark brown flecks between the veins. The same chlorotic appearance is also found in the upper leaves of tomatoes and cucumbers suffering from a manganese deficiency, but at a later stage the whole leaf assumes a mottled appearance. In beetroot the manganese deficiency manifests itself as soon as the plants are six inches high. The general symptoms are a spotted chlorosos. Subsequently, the leaves become covered with numerous yellow patches which occur on the tissues between the veining.

In green beans the first symtom of a manganese deficiency is a slight yellowing of the upper leaves of the plant. Only after a few days do the cotyledons become chlorotic, by which time the disease has already reached a much more serious stage. The leaves then become mottled and do not develop to their normal size.

Tobacco plants suffering from a manganese deficiency are completely stunted, the upper leaves of the plant becoming chlorotic. At a later stage the leaves are characterized by the appearance of necrotic patches which fall out in course of time, leaving holes in the leaves. The same symptoms are observed in tomato, green-bean and oat plants.

Occurrence, Characteristics and Function.

Manganese is a rare constituent of igneous rocks in which it occurs in the form of mangano-compounds. Weathering of the rock results in the ready liberation of manganese, the process corresponding to that in the case of ferro-compounds. The manganese is dissolved and carried into the soil in the form of manganese-bicarbonate. A certain percentage of the manganese in some soils occurs in several ferro-magnesium minerals and in other complex silicates, some of which are only very slightly soluble in water.

The only two forms of manganese, however, which can be of importance to plant growth are the bivalent manganese ions in the absorption complex (i.e. exchangeable manganese) and manganese dioxide. The relative quantities of these two forms are controlled by the pH value and the oxidation-reduction equilibrium of the soil. Manganese compounds are much more soluble in acid soils than in neutral or alkaline soils, and also much more soluble in reducing than in oxidising soils. In consequence of the fact that manganese very readily undergoes the different forms of oxidation it is particularly liable to solution and disintegration. The higher oxides of manganese are extremely insoluable, and unless they are reduced to bivalent form, they remain unavailable to plants. Manganese cannot become unavailable in strongly reducing soils since the higher oxides are reduced to soluble manganese compounds. It has been observed that diseases due to a manganese deficiency are more prevalent during dry seasons than during wet seasons and also that plants on low-lying ground which frequently becomes wetter than the surrounding land are less subject to these diseases.

On sandy soil a manganese deficiency may be the result of leaching of soluble manganese, especially if the soil is rich in organic material. Usually, however, a manganese deficiency in soil is due to an excessive pH value resulting from the application to too much lime or from veld-burning. The low manganese content of the parent rock from which the soil of a particular area is derived may also be responsible for a manganese deficiency.

It is generally accepted that manganese is an essential plant nutrient. In the second place, it acts as a catalyst, which is essential for certain biochemical reactions in the metabolism of the plant. The possibility also exists that the presence of manganese is connected with the assimilation of carbon by the plant, and in this respect the high concentration of manganese in the leaves and the lower concentration of the metal in the roots of various plants are particularly striking, as is apparent from Table I.

Five samples of each of three kinds of vegetable were obtained from different localities in Stellenbosch. The samples were first washed in distilled water then finely chopped and allowed to become air-dried. They were then dried in an air-oven at 100° C., pulverised in an agate mortar and stored in bottles for analysis.

TABLE I.

Plant.	Percentage Dry Material.			Parts Manganese per Million.		
	Max.	Min.	Av.	Max.	Min.	Av.
						%
Beetroot	12·7	7·3	10·5	93	42·0	56·0
Beet Leaves	14·6	8·2	12·1	220	160·0	192·0
Carrots	11·3	9·1	10·7	103	35·0	56·0
Carrot leaves	22·5	14·7	18·1	180	60·0	118·0
Turnips	11·4	7·5	9·6	21	10·5	13·9
Turnip leaves	16·4	10·5	12·9	150	75·0	108·0

Reference to the data in Table I reflects a considerable difference in the manganese content of samples of the same kind of plant,

depending upon the locality in which they were grown. In the case of the principal essential elements as, for example, potassium and calcium, etc., such a wide variation is never encountered. It may therefore be concluded that plants assimilate manganese in much larger quantities than is apparently necessary.

It has also been found that the manganese content of oats in the flowering stage may range from 25 to 287 parts per million.

In comparison with other plants which have been analysed, it appears that wheat plants are relatively rich in manganese and, consequently, that considerable quantities of the element are absorbed. In the case of wheat, the straw contains more manganese than the seed. As was also found with other plants analysed, the variation in the quantity of manganese present in the straw was greater than that in the seed. In pot experiments, analyses which were made of an orchard soil from Elgin showed a variation in the manganese content of wheat grains ranging from 60 to 120 parts per million, while that in the case of the straw varied from 62 to 290 parts per million.

Soil Surveys for Manganese.

Various soil types from the western Cape Province were analysed with a view to discovering the extent to which these types vary in respect of their manganese content. The surveys cover a fairly wide area, which includes several of the most important grain-producing districts.

The analyses were carried out with one per cent. citric acid because the method involved is easy and inexpensive, especially for routine work.

The results of the analyses appear to indicate that similar types of soil differ greatly in respect of their manganese content. Even soils from places situated close together show considerable differences.

On the whole, it would appear as if the Piquetberg red loam and the Malmesbury slate soils have a higher manganese content than the granites and Table-Mountain sandstone soils.

The following are the highest figures obtained for these soils.

TABLE II.

	Manganese, Parts per Million.	pH.
Table-Mountain sandstone, Riebeeck	8·0	4·8
Young granite, Darling	24·0	5·5
Malmesbury slate, Klipheuwel	231·3	5·7
Piquetberg red loam	347·0	5·9

Except in cases where the soil has been turned, the manganese content of the surface soil is always higher than that of the subsoil.

Manganese Deficiency in the Western Cape Province.

On the Cape Flats where there is a general manganese deficiency, the soil is of a sandy type with a pH varying round about 7·5 and a manganese content ranging from a bare trace to 2 parts per million (1 per cent. citric acid solution). In comparison with other soils the

manganese content is very low, while the pH is high. In addition, many of the ordinary sandy soils in this area contain a considerable amount of carbonate of lime, which reduces the solubility of the manganese still further. Where a manganese deficiency occurred in the area mentioned, bean plants were effectively sprayed with a $\frac{1}{4}$ per cent. KMn04 solution, and maize, tomato, potato and pea plants with a $\frac{1}{4}$ to $\frac{1}{2}$ per cent. $MnSO_4$ solution.

In Somerset West there is a case where a manganese deficiency occurs in a vineyard. The leaves of the affected vines were chlorotic between the veins, and the grape-yield was poor. Not only the soil, which is derived from the weathering of slate between Table-Mountain sandstone strata, but also the chlorotic leaves were analysed. The soil showed a manganese content of 5·3 parts per million (1 per cent. citric acid solution), which is very low in comparison with other orchard soils. The pH was 4·99. The chlorotic leaves had a manganese content of 32 parts per million. Compared with healthy vine leaves from another orchard in which the manganese content ranged from 360 to 413 parts per million, the affected leaves had an extremely low manganese content which indicated that very little of the element had been absorbed.

In the Somerset West district a manganese deficiency was also determined in potatoes and green beans and was overcome by applications of $MnSO_4$ to the soil. Peach trees in this area also reacted to spraying with $\frac{1}{2}$ per cent. $MnSO_4$ solution, and 1 per cent. strength was successfully used on pear and citrus trees.

At Stellenbosch, citrus and peach trees, as well as bean plants, and also nectarines and plums at Brakenfel, were successfully sprayed with one or another of the following solutions: $\frac{1}{4}$ per cent. $KMnO_4$, 1 per cent. $MnSO_4$ + $\frac{1}{2}$ per cent. $Ca(OH)^2$, and $\frac{1}{4}$ per cent. $MnSO_4$.

At Constantia a manganese deficiency was also discovered in vines, as well as in granadilla, apricot and chestnut trees. At Biene Donne, citrus trees suffering from a manganese deficiency were successfully treated by spraying with a 1 per cent. $MnSO_4$ solution.

In orchards at Elgin where a manganese deficiency was also determined in peach trees, the soils are derived from the Bokkeveld series and, consequently, the occurrence of ferruginous shales is common. The soil is shallow, rich in iron and gravelly.

Representative soil samples were taken from among a group of affected trees, as well as from among a group of healthy trees in the same orchard. The symptoms displayed by the affected trees were a general chlorosis. Only the tissues between the veins were chlorotic, the veins themselves being slightly greener than the chlorotic tissue. The trees produced poor yields.

It was assumed that the symptoms occurring in this orchard were due to a deficiency of trace elements. Consequently, an exhaustive analysis was made of the soil in order to make quite certain that none of the common elements was lacking. The results of the analysis showed, however, that the soil where the affected trees were standing contained less manganese in every respect than that on which the healthy trees were growing, as is reflected in Table III.

TABLE III.—*Blackburn Orchard No.* 3.

	Manganese, Parts per Million.	
	Sample from among Affected Trees.	Sample from among Healthy Trees.
Total	40·000	80·000
Soluble in 22 per cent. HCL	21·000	37·000
Soluble in 1 per cent. citric acid	9·600	14·900
Soluble in $\frac{N}{2}$ acetic acid	8·500	18·000
Soluble in water	0·277	0·420

Some of the trees which showed symptoms of the disease were injected in spring with manganese solutions of various concentrations, while others had already been sprayed with a manganese solution during the winter. Later in the season samples of the leaves were taken from the treated trees where the soil samples were taken. These leaves were then subjected to analysis.

TABLE IV.

No.	Treatment.	Leaf symptoms.	Natural Moisture (air-dried basis).	Hygroscopic Moisture (abs. dry basis).	Manganese, parts per million.
1	Not injected	Slightly chlorotic	61·1	9·33	14·0
2	Not injected	Chlorotic	62·1	9·93	8·5
3	Not injected	Severely chlorotic	64·0	8·72	5·0
4	Injected with Mn	Symptoms again visible	61·5	10·30	15·0
5	Injected with Mn	Healthy	60·8	8·97	91·0
6	Injected with Mn	Healthy	62·6	9·41	23·2
7	Sprayed in winter with Mn.	Healthy	61·3	9·60	21·5
8	Not injected	Healthy orchard	61·1	10·02	50·0

According to Tables III and IV there is a definite manganese deficiency in this orchard. Numbers 1, 2 and 3 are samples of chlorotic leaves with a manganese content of 14, 8·5 and 5 parts per million, respectively, the figures being very low when compared with that of sample No. 8 from the healthy orchard. Nos. 4 and 5 are leaf samples of injected trees and have a manganese content of 15 and 19 parts per million, respectively. The symptoms were again visible in the trees from which sample No. 4 was taken, but the trees of No. 5 were healthy. The difference between the manganese content of the last-mentioned two samples was only 4 parts per million.

It is not difficult at this stage to determine whether a soil is deficient in manganese or not because a chemical analysis will readily establish the fact. The difficulty, however, is to determine whether the manganese present in the soil is available to plants or not.

A water or 1 per cent. citric acid extract will not always be an accurate indication of the availability of manganese in soils since there are so many other factors in the soil which affect the solubility of this element.

Variability of Maize By-Products.

Dr. J. C. Swart, Department of Animal Husbandry,
Stellenbosch-Elsenburg College of Agriculture.

THE quantity of maize by-products coming on the market as stock feeds is steadily increasing. Especially at present, with a threatening shortage of maize meal for stock feed, farmers are becoming more and more dependent on these by-products for replacing the maize meal in their stock rations. It has come to our notice, however, that such maize by-products may vary widely in composition and, consequently, feeding value. The result is that rations made up with these maize products do not always give the expected results. Stock feeders consequently come to view these products in a bad light. Besides, this variation in composition makes the correct balancing of rations most difficult.

In order to ascertain the true facts, samples of two of these by-products which were extensively used, viz., hominy chop and maize germ meal, were collected from different firms. These were analysed and their digestibility by rates determined. The digestion coefficients obtained with rats are not applicable to ruminants, but they serve the useful purpose of comparison. In Table I the composition of the feeds is given.

TABLE 1.—*Percentage Compositions of Feeds (Air Dry Basis).*

Feed.	Sample.	Moisture.	Ash.	Crude Protein.	Crude Fibre.	Ether Extract.	Nitrogen-free Extract.
Hominy Chop........	L	12·76	1·01	4·54	15·88	2·67	63·14
,, ,, ...	G	12·16	1·60	7·22	14·36	4·62	60·04
,, ,, ...	I	12·76	1·26	9·26	13·08	3·42	60·22
,, ,, ...	F	11·27	1·88	8·50	12·69	5·97	59·69
,, ,, ...	J	13·25	1·85	7·80	11·65	6·46	58·99
,, ,, ...	K	11·65	2·36	8·62	9·62	6·59	61·16
,, ,, ...	E	16·21	2·51	10·19	8·59	6·04	56·46
,, ,, ...	C	11·00	2·79	9·69	7·82	8·85	59·85
,, ,, ...	A	10·81	2·26	9·58	7·26	8·94	61·15
,, ,, ...	H	12·71	1·81	9·54	7·25	6·94	61·75
,, ,, ...	B	13·31	2·06	9·93	7·22	9·15	58·33
,, ,, ...	D	12·60	1·96	10·17	6·09	7·81	61·37
Maize Germ Meal....	Q	13·88	1·62	6·37	11·69	4·03	62·41
,, ...	R	12·85	1·78	8·86	8·14	8·41	59·96
,, ...	O	11·33	1·88	10·96	6·06	8·16	61·71
,, ...	M	13·19	2·51	9·41	5·27	9·75	59·87
,, ...	N	11·93	2·42	9·99	4·46	9·60	61·60
Maize Meal.........	P	13·29	1·67	9·25	5·31	6·74	63·74

From the above table it is clear that not only the hominy chop, but also the germ meal sold to stock feeders are very variable products. In fact, a shocking state of affairs is brought to light. The protein-contents of the twelve samples of hominy chop collected actually varied from 4·54 to 10·19 per cent., the ether extract (chiefly fats) from 2·67 to 9·15 per cent. and the crude fibre content from 15·88 to 6·09 per cent. The five samples of germ meal varied in protein

content from 6·37 to 10·96 per cent., in ether extract from 4·03 to 9·75 per cent. and in fibre content from 11·69 to 4·46 per cent. Even the maize meal analysed for purposes of comparison had an astoninshingly high fibre content.

Definitions and Standards.

Hominy Chop.—The official definition for hominy chop, hominy feed or hominy meal adopted by Texas, U.S.A., is " the kiln-dried mixture of the mill-run bran coating, the mill-run germ with or without a partial extraction of the oil and a part of the starchy portion of the corn kernel obtained in the manufacture of hominy, hominy grits, and corn meal by the degerming process ". The official standard adopted is as follows:—It must contain not less than 10 per cent. of crude protein and 6 per cent. of crude fat, and not more than 7 per cent. of crude fibre.

In Table 2, a comparison of hominy chop is given as found in different countries.

TABLE 2.—*Compositions of Hominy Chop Compared.*

Country or Author.	Crude Protein.	Crude Fat.	Crude Fibre.
	%	%	%
Canadian Standard	—	5·0 (min.)	—
Texas Standard	10·0 (min.)	6·0 (min.)	7·0 (max.)
Ohio (average)	—	—	4·8
Vermont (average 78 samples)	10·9	6·9	4·1
Maine (average 9 firms)	11·4	7·5	4·7
Morison (average 1,270 analyses)	11·0	6·9	4·8
Wood & Woodman (High grade)	10·6	8·0	4·4
(Low grade)	9·5	6·2	8·5
South Africa (average 12 firms)	8·7	6·4	10·1

From the above it is clear that on the average, the protein content of the hominy chop sold in this country is much too low and the fibre content far too high. The impression is gained that too much maize bran or other fibrous material is added. As maize bran, the most fibrous part of the maize kernel has a maximum fibre content of 12 per cent., a considerable proportion of the hominy chop on the market must contain a material more fibrous than the bran. It would not be surprising if this material is cobmeal.

If the Texas standard had been applied to the 12 South African hominy chops, only one (8 per cent.) would have conformed to the protein requirement, eight (75 per cent.) to the fat requirement, while only one (8 per cent.) would have passed the fibre test.

Only four registrations were found in the 1941 list of registered feeds and the average analysis for these was:—protein 10·2 per cent., fat 7·4 per cent., and fibre 8·4 per cent.

Maize Germ Meal and Maize Germ Oil Meal.

In Canada and America maize germ meal and maize germ oil meal are marketed as different products. *Maize germ meal* is defined as " the residual product after extraction of oil from corn germ with other parts of the corn kernel as separated in the dry milling process of manufacture of corn meal, corn grits, hominy feed and other corn products ".

In Table 3 a few average compositions of maize germ meals are given.

TABLE 3.—*Compositions of Maize Germ Meals.*

Country or Author.	Crude Protein.	Crude Fat.	Crude Fibre.
	%	%	%
Texas Standard	18·0 (min.)	7·0 (min.)	9·0 (max.)
Morrison	19·8	7·8	8·9
South Africa (average 5 firms)	9·1	8·0	7·1

From the above it would appear that the protein content of the feed sold as maize germ meal in South Africa is far too low and is very similar in composition to hominy chop. In the 1941 list of registered feeds only two brands were found and these have an average composition of 11·5 per cent. protein, 10·1 per cent. crude fat and 3·8 per cent. crude fibre.

Maize germ oil meal is described as the ground maize oil cake which is the " residual product after extraction of oil from corn germ as separated in the wet milling process of manufacture of corn starch, corn syrup and other corn products ". In the 1941 feed list we find only one registration of a product guaranteed to contain 20·5 per cent. protein, 4 per cent. fat, 14·3 per cent. fibre and 2·8 per cent. ash. This is therefore the nearest approach to a maize germ product either found or listed.

Digestibility of Hominy Chop and Maize Germ Meal as Determined with Rats.

The analysis alone of a feed is not sufficient to allow of an estimate being formed of its full value. Digestion trials were therefore made with rats. As previously stated, the digestion coefficients thus obtained are not applicable to ruminants but they may at least be used for the purpose of comparison and reflect the value of the feeds much better than the analysis alone.

In Table 4, the digestion coefficients are given.

TABLE 4.—*Digestion Coefficients as Determined with Rats.* (*on dry basis*).

Feed.	Sample.	Dry Matter.	Crude Protein.	Crude Fibre.	Crude Fat.	Nitrogen-free Extract.
Hominy Chop	L	21·2	24·7	4·5	79·4	23·4
,,	G	30·0	47·4	5·5	87·9	29·6
,,	I	35·3	65·0	6·3	86·7	34·8
,,	F	36·9	50·6	5·1	89·0	37·2
,,	J	42·0	54·4	6·8	90·8	42·4
,,	K	52·0	62·8	5·3	89·9	56·2
,,	E	55·6	62·9	13·6	66·3	60·0
,,	C	59·5	66·6	6·3	91·8	61·6
,,	A	64·3	71·8	12·8	91·3	65·5
,,	H	65·2	71·1	13·7	88·9	68·1
,,	B	62·9	69·2	11·6	91·1	64·5
,,	D	69·6	72·5	15·0	93·2	71·6
Maize Germ Meal	Q	40·8	51·6	7·9	73·7	44·0
,,	R	62·5	72·6	11·3	93·3	64·1
,,	O	76·6	81·7	29·0	93·2	78·6
,,	M	79·7	74·7	41·0	91·9	82·9
,,	N	80·9	77·8	32·3	91·9	83·8
Maize Meal	P	76·2	76·5	20·5	90·3	79·6

In the above table the samples are tabulated in order from the highest to the lowest crude fibre content. It is therefore clear from the table that the digestibility of the crude fibre, the protein and the nitrogen-free extract shows a considerable decrease with an increase in the fibre content. It would therefore appear that those feeds with the high fibre content must have contained a considerable amount of material of a very indigestible nature.

In Table 5, the digestible nutrients in 100 lb. of feed are given

TABLE 5.—*Digestible Nutrients in 100 lb. Feed (Air dry).*

Feed.	Sample.	Crude Protein.	Crude Fibre.	Crude Fat.	N-free Extract.	Total Dig. Nutrients.	Nutritive Ratio.
Hominy Chop........	L	3·48	0·72	2·12	14·77	23·74	5·8
,, ...	G	3·43	0·79	4·06	17·79	31·14	8·1
,, ...	I	6·02	0·82	2·97	20·96	34·47	4·7
,, ...	F	4·30	0·65	5·32	22·20	39·13	8·1
,, ...	J	4·24	0·79	5·86	25·02	43·24	9·2
,, ...	K	5·42	0·50	5·93	34·37	53·63	8·9
,, ...	E	6·43	1·16	4·01	33·88	50·49	6·9
,, ...	C	6·46	0·49	8·12	36·86	62·08	8·6
,, ...	A	6·85	0·93	8·16	40·08	66·22	8·7
,, ...	H	6·78	1·00	6·17	42·06	63·72	8·4
,, ...	B	6·90	0·84	8·30	37·60	64·08	8·3
,, ...	D	7·35	0·91	7·28	43·96	68·60	8·3
Maize Germ Meal....	Q	4·30	0·65	5·32	22·20	39·13	8·1
,, ...	R	6·45	0·92	7·84	38·42	63·43	8·8
,, ...	O	8·92	1·76	7·61	48·53	76·32	7·6
,, ...	M	7·01	1·53	8·96	49·66	78·35	10·2
,, ...	N	7·74	1·43	8·82	51·60	80·64	9·4
Maize Meal..........	P	7·10	1·08	6·09	50·72	72·59	9·2

The above table clearly reflects the low feeding value of the great majority of hominy chops and maize germ meals sold in this country. A comparison of the hominy chops with the yellow maize meal used in these trials reveals that 11 of the 12 samples had less digestible protein than the maize meal, whereas they should really have contained more. In total digestible nutrients, hominy chop should also rank higher than maize meal, whereas actually all the samples of hominy chop were much inferior to the maize meal in this respect. The only conclusion to be drawn is that most of the feeds placed on the market under the name of hominy chop, are much inferior in feeding value to standard hominy chop.

As regards maize germ meal, the position is slightly better, though here also feeds are sold under the name of maize germ meal which are as bad as some of the worst hominy chops to be found on the market. Maize germ meal should contain approximately double the amount of digestible protein found in maize meal. Of the samples collected the best could only equal the digestible protein content af maize meal while the rest fell far short in this respect.

Study of the Analysis.

Unfortunately, hominy chop and maize germ meal are not defined by regulation in the Union, nor is any standard laid down for minimum fat protein and minimum fibre content. This leaves

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Sheep-Branding Trials.

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FARMERS throughout the world still find it necessary, for various reasons, to use identification marks on sheep. In the days of unfenced camps there was constant danger of flocks from adjoining farms getting mixed. The trouble involved in separating the animals again was ample justification for the use of some branding material to permit identification. Even to-day, however, for reasons well-known to the farmer, the use of branding fluids facilitates the management of sheep.

An ideal sheep-marking fluid should possess the following properties:—

(*a*) It should produce a distinct and clear-cut mark.
(*b*) The mark should remain clearly visible for a period of at least 8-12 months, i.e. from one shearing to the next.
(*c*) The substance should be of such a nature that it can be removed completely when the wool is subjected to scouring.

Success has been attained in the manufacture of branding fluids possessing qualities of distinctness and durability but, unfortunately, up to the present no marking fluid possesses the all-important property of being *completely* removable from the wool when subjected to the scouring process.

In the past, users of wool have always had a serious complaint against portions of the Union's clip, on account of the presence in the wool of tar, paint or other injurious branding materials. It will be readily appreciated that the ultimate use to which such wools could be put is very much restricted, since, unless the finished fabrics are dyed into dark shades, the discolouring of the wool by the branding material invariably shows up.

In order to prevent wool from being contaminated with an injurious branding material, the Government has passed a regulation demanding that all wool shall be free from tar, paint or any other branding material which may have been used for the purpose of marking sheep. The regulation has had very salutary results, but no matter how carefully the operation is done, small particles of the brand may remain in the wool. In other words, clipping off the brands is not entirely satisfactory, both from the farmer's and manufacturer's point of view.

Testing of Branding Fluids.

The Grootfontein College of Agriculture has therefore made an extensive survey of the various types of branding fluids in use, in order to determine their suitability and, in particular, to ascertain whether the branding materials can be removed in the manufacturing processes.

In these experiments, twelve marking fluids, including red roof paint and coal tar were tested. Sixty merino weaner lambs, 9 to 10 months old, and specially selected for uniformity prior to shearing, were used as experimental animals. The sheep were divided into six groups of ten each. The left side of each sheep was used for one brand, and the right side for another. Three "O" marks, applied by means of a branding iron $\frac{3}{8}$ in. thick, an inner diameter

of three inches, were made on each side, viz., on the shoulder, mid rib and thigh.

The brands were applied on 4/1/40, i.e. three weeks after shearing, and inspections of the brands were made at three-monthly intervals. The method adopted was to line the sheep up broadside on with the sun shining directly on the wool surface presented to the observer, who stood at a distance of six yards from the animals. The visibility of the brands was adjudged as being either very good, good, fair, indifferent, or invisible, the respective values 4, 3, 2, 1, and 0 being assigned. Inspections were made only when the visibility was good and the same person made the observation throughout the whole period. At all inspections he was totally unaware of the identity of the various brands until after the work was completed.

At the conclusion of the experiment, the wool from the area covered by the brand was clipped close to the skin, and subjected to scouring tests.*

Results and Discussion.

(i) *Degree of Visibility.*—Three inspections were made during the period of 232 days. Unfortunately, management difficulties prevented shearing being delayed to allow another inspection to be made at 12 months' growth, i.e. the period the brands are normally expected to last. The results of the three inspections are recorded in Table I in which the degree of visibility of each brand is expressed as a percentage of the ideal.

TABLE *I.—Percentage Visibility for the group.*

Marking Fluid.	1st Inspection 4/4/40, i.e. after 90 days.	2nd Inspection 4/7/40, i.e. after 182 days.	3rd Inspection after 232 days.
No. 1	97·5	87·5	80·0
No. 2 Red (roof paint)	97·5	60·0	47·5
No. 3	95·0	87·5	85·0
No. 4	72·0	52·2	37·5
No. 5	35·0	35·0	35·0
No. 6	40·0	27·5	25·0
No. 7	100·0	100·0	100·0
No. 8	95·0	67·5	57·5
No. 9	82·5	67·5	62·5
No. 10 (Coal Tar)	100·0	100·0	100·0
No. 11	80·0	77·5	75·0
No. 12	67·5	45·0	33·5

As rainfall appears to have had a marked influence on the visibility of the brands, details of rainfall are given in Table II.

TABLE II.—*Rainfall in Karoo area.*

Period.	Rainfall in Inches.	Number of Heavy Showers.
From marking on 4/1/40 to First Inspection 4/4/40 (90 days)	8·68	2
From First Inspection 4/4/40 to Second Inspection 4/7/40 92 days)	2·73	1
From Second Inspection 4/7/40 to Third Inspection 23/8/40 (50 days)	0·3	0
TOTAL	11·71	3

* By the Division of Chemical Services.

The following deductions are made from Tables I and II:—

At the first inspection, i.e. 90 days subsequent to branding, certain brands, especially Nos. 5 and 6, faded to a marked degree. It would appear that some of the branding fluids were washed out to a certain extent by heavy showers. Rain is not the only factor responsible for the partial disappearance of the brands, however, as extreme heat, frosts, and dust also have a detrimental influence. This deduction is made from the fact that further fading took place during the period 4/4/40 to 4/7/40 when only 2.3 inches of rain fell, and fading continued during the third period 4/7/40-23/8/40 in spite of the fact that practically no rain fell. Hence rain is only a contributory factor to the vanishing of the brands. It also became apparent that rain has more effect on some brands than on others.

There are indications that the consistency of a branding fluid and also the colouring matter used in its make-up are important factors in determining the durability of the brand. For instance, coal tar showed 100 per cent. visibility throughout the trial, although the brands faded to a certain extent, showng a blue and oily appearance. Similarly, brand No. 7 maintained 100 per cent. visibility and showed very little if any fading. In both cases the brands remained intact, showing relatively little signs of disintegration. On the other hand, fluids No. 6 and No. 12 very soon became faded and washed out, and disintegration of the brand took place to such an extent that its visibility became indifferent at the conclusion of the trial.

The observations also showed that the durability of the different marking fluids on the market is very variable, ranging from 4 months to at least 9 months, the latter being the period a good branding fluid should maintain a reasonable degree of visibility to be useful under practical sheep-farming conditions.

(ii) *Scouring Tests*.—The scouring, depitching and carbonizing tests on the wool reveal the following:

1. None of the branding materials scoured out completely, even though the strength of the scouring liquor was stronger than that generally used for this type of wool, and in spite of two additional treatments, not normally used, namely, depitching and carbonizing.
2. Small portions of the brand, present after scouring, "ran" or "spread" in the presence of heat necessary during the felting tests. The damage caused by this "spread" in a felted or even partly felted material is irreparable.
3. Considering the scouring results in conjunction with the durability trials, the branding fluids which showed the best visibility, i.e. 75 per cent. and over, at the conclusion of the experiment, revealed the greatest degree of marking of the felt.

In view of this finding it is thought that the manufacturers of the branding materials, of which the visibility was of short duration, evidently made an attempt to secure a branding material that would scour out. In their attempt, however, they not only reduced the efficiency of the material, but also evolved a compound which does not scour out completely.

These results confirm the need for the regulation enforcing farmers to clip off all brands. In view of the absence of efficient branding fluids and the need for State regulations governing brands, farmers who are forced to use a branding fluid should regard dura-

bility of primary importance. The poor lasting qualities of certain branding materials not only make it necessary that sheep should be branded twice between successive shearings, but also increase the danger of the brands being overlooked and not removed by the shearers.

Recommendations.

In the present circumstances, farmers are advised to *refrain from using branding materials*, but, if circumstances necessitate the use of a branding material, it will be in the interest of the individual as well as that of the country to use *a brand that will show the maximum durability*, coal tar excepted.

Since no branding fluid scours out completely and the regulation does not discriminate between any branding materials, the only criterion of a good branding fluid is its durability under ordinary veld conditions.

The Breeding and use of Draught Horses in South Africa.—

[*Continued from page* 359.

a heavy draught type, its inherited "oriental" blood and qualities such as temperament, clean limbs, flat, good bone and good feet remained.

When Percherons are mated with light-horse mares, this "breed" or blood relationship establishes an affinity of genetic make-up resulting in the production of very fine animals, as can be seen in their thousands where Percheron stallions have been used for 20 or more years in studs counting up to 300 or more mares.

For these and other reasons the Percheron is to-day the most popular improver for the production of a heavier type of farm horse a breeding policy which finds support in, or rather is, a confirmation of the experience of the practical farmers of the United States of America where 60 per cent. of all purebred horses are Percherons.

"From a patronage of the most miscellaneous sort of mares, a Percheron progeny will average a large percentage of marketable colts varying, it is true, from weight-carrying horses and hunters and even harness horses to the best of draught horses, but each good in his class." This attribute, more than any other, made the Percheron the favourite in the United States of America.

In so far the Percheron is concerned, South Africa has much more in common with the United States of America in regard to climate, type of farming, etc., than with the natural home of other draught breeds.

(*N.B.*—A subsequent instalment will deal with the Draught horse type.)

Swill as Pig Feed.

L. H. Bartel and S. A. Oosthuizen, Stellenbosch-Elsenburg College of Agriculture.

BESIDES the kitchen waste or swill of the hotels and restaurants of the big cities, the number of military camps and institutions has greatly increased the sources and amounts of swill. Full use of the by-products from these sources would greatly assist in solving pig-feeding problems.

Kitchen waste or swill is not a standardized product and its feeding value will depend on factors such as the presence or absence of desirable or undesirable or even poisonous substances, such as a too high concentration of washing soda and salt or even pieces of glass. Average samples of swill also vary in value according to the standard of living of people from whose houses it is collected. A further determining factor is its freshness.

Scraps of raw or cooked meat, fish and bones, as well as good butcher's offal are excellent sources of animal protein. Next in importance are non-fibrous starchy foods, such as potatoes, bread crusts and crumbs, cakes, pastry and porridge. Fresh vegetables are also of considerable value if they are *really fresh*, and in this list are included vegetables such as lettuce, cabbage, tomatoes, apples and other fresh fruit.

Apart from bits of glass or tin, too much washing soda, salt or ash, other undesirable substances are those which, although edible, possess no feeding value and may even cause digestive disorders. These include substances such as hard cabbage stalks, orange and potato peel, tea leaves and coffee grounds.

According to American data, swill from hotels, restaurants and institutions and from army, navy and air force stations is superior to normal household swill. Average municipal swill is stated to contain about 30 per cent. of dry matter, and the composition of this dry matter is roughly 15 to 25 per cent. protein, 40 to 50 per cent. carbohydrates, 20 to 25 per cent. fat and 10 to 15 per cent. minerals and ash. From this it is clear that normal swill, without the addition of anything else, is more or less a balanced feed for pigs.

Processing.

Since much has already been done in this direction in Britain, a brief résumé of the system adopted there will serve as an indication how swill can be made available as pig-feed.

In Britain all swill must be boiled and sterilized before it is fed to the animals, because of the danger of swine fever and foot and mouth disease. Swill can be fed in four conditions, viz.: (*a*) Uncooked or in the fresh condition, (*b*) boiled or steamed, (*c*) in concentrated or paste form, (*d*) in the form of a dry meal or powder.

(*a*) Swill can be supplied most readily and economically in the raw state, but this increases the danger of infection. The use of raw swill is also restricted by the fact that it deteriorates rapidly when stored or when conveyed over considerable distances. Furthermore, it contains an unduly high percentage of moisture which renders conveyance difficult. And finally, all farmers do not possess boiling or steaming equipment.

(*b*) In metropolitan areas organizations have been founded which undertake to collect and boil the swill. The boiling process is conducted in enormous vats with steam jets. Such boiled swill can be conveyed over longer distances or kept for a longer period without undue deterioration, though it is more difficult to transport owing to the higher moisture content. Previously the law required farmers who purchased swill to boil it before feeding it to their animals, whether it had been previously boiled or not. However, local authorities may now grant certificates to premises where adequate arrangements are available, which render the boiling of swill obtained therefrom unnecessary.

(*c*) Where urban swill cannot be disposed of in the raw or boiled form in the close neighbourhood, it is semi-dried or concentrated to a paste. This process sterilizes the material, improves its keeping quality, and reduces its bulk by some two-thirds and its weight by one-third.

(*d*) Finally, in certain large population centres swill is converted into a meal in fish-meal plants. Unfortunately, however, there can be no question under present circumstances of building new plants for the preparation of this form of swill. Complete drying gives a product with about 10 to 13 per cent. moisture, comparable in dryness with ordinary feeding meals. This dried-food waste is made available in *balanced form* after it has been admixed with other purchased feeds.

The general practice now in Britain is to buy strong stores of 6 to 7 stone, as one man put it, if a weaner meets with an accident it is a dead loss, but a strong store may provide some edible pork. Furthermore the strong pigs take to swill feeding with less upset to the digestion. The pigs come in at 6 to 7 stone and go off to the abattoirs at 16 to 17 stone (dead weight). The *Large White* × *Essex* is a very popular cross in London.

The Problem in South Africa.

The problem of stock feed in this country is becoming a very serious one. Mealie meal forms the basis of most animal rations in South Africa, and it is fairly certain that a subnormal maize crop will be harvested this season. Moreover, drought which prevailed over extensive areas of the interior has reduced the supply of slaughter stock. It must also be borne in mind that the consumption of meat is far in excess of the normal supplies during a very good year, whilst there is a definite shortage of processed pig products such as ham and bacon.

The success of a scheme for utilizing swill for pig-feeding depends entirely on the numbers and availability of the desired type of pigs near the feeding areas. Fortunately, this is the case in the western Cape Province, especially on grain farms, where it will be possible to purchase large numbers of pigs at about four to six months of age and weighing about 70 to 100 lb., to be fed on small farms in the vicinity of Cape Town to a live weight of about 200 lb. If a Large White boar is used with the ordinary farm stock, litters may be expected with a conformation and quality suitable for bacon and ham. No elaborate sties are required for sheltering and fattening of such pigs. A warm pen constructed of corrugated or other iron sheets to sleep in during the winter, some trees for shade and a pool of water in which to wallow, are the only equipment which must be provided. The feed may be given in old iron railway sleepers.

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Price Control of the Present Maize Crop.

Dr. J. F. W. Grosskopf, Director of Marketing and Distribution.

A NEW maize season began in May; but this year it was far more difficult than usual to estimate with any degree of accuracy the size of the coming crop. A severe drought prevailed until midsummer, and many fields of maize were planted dangerously late, so that it is almost impossible to arrive at a reasonably reliable figure of the quantity of maize that will be available to the nation. What is certain, however, is that the maize crop will be appreciably smaller than that of 1941.

Maize is one of the most important human foods in South Africa and certainly also the most important animal feed. The Minister of Agriculture and Forestry, as Controller of Food Supplies, has therefore decided to take timely steps in order to control the distribution of the present crop. Fortunately, he had at his disposal the well-organized machinery of the Mealie Industry Control Board which the Board itself placed at his disposal.

Obviously, the chief aim of control should be to ensure that the present crop is evenly distributed over the twelve months before us, so that human requirements may be safeguarded to the full. After that, those uses of maize which are most essential from the broad national aspect should have the first claim to be satisfied.

Prices to Producers.

It is clear that in such a year of lower yields per acre the welfare of the producer group has to receive sympathetic consideration. Consequently the Food Controller announced in Parliament that a basic price of 15s. a bag (in bags) for grades 2 and 6 would be assured to maize growers. This price, it is hoped, will yield to the Union's producers and aggregate cash income as nearly equal as possible to that of the previous season. In spite of the decision not to discard the grade distinctions of many years' trade usage, a further concession will be made to producers in the price determinations. The old price, spread between various grades, will be narrowed so as to leave only a twopenny margin. It has further been decided to lift the price level of "Fours" (flat yellow) to that of "Twos" and "Sixes", because the compulsory admixture of yellow maize in members and non-members, at the same fixed prices.
for flat white "Twos".

The Mealie Industry Control Board will register maize traders, who alone may accept maize from producers and will have to pay them the fixed prices in cash. For grades 2, 4 and 6 the price is 15s. per 200 lb. net in bags; for grades 3, 5 and 7 it is 14s. 10d.; and 14s. 8d. for No. 8 maize. The maize co-operatives, too, at their numerous receiving depôts, will accept mealies from growers, both members and non-members, at the same fixed prices.

Producers who deliver their maize into grain-elevators can dispose of their elevator receipts only to the Mealie Control Board, and producers must hand such certificates to their agents, who will forward them to the Board. The prices in this case will be 9d. per 200 lb. less than the corresponding prices per bag. In the past, the difference was generally 1s., but this spread has been reduced because

elevator maize is clean maize. The Board will accordingly, in re-selling elevator maize in bags to millers and others, demand 3d. more for elevator grades.

Only registered traders (including co-operative organizations) may therefore accept delivery of maize from producers. It is the duty of the farmer to satisfy himself that the person to whom he sells is actually registered. The intention is that the producer, as was customary in the past, should deliver to the nearest trader. This would normally mean delivery at the trader's nearest railway station, where the grower will receive the proclaimed price of 15s. for grades 2, 4 and 6; 14s. 10d. for grades 3, 5 and 7; and 14s. 8d. for "Eights". If, by agreement between farmer and registered trader, delivery is effected at some other convenient railway point or at a point not on the railway, the full proclaimed price shall be payable at such other point.

Before being appointed, registered traders have to accept the conditions laid down by the Mealie Industry Control Board. One of these conditions is that every trader shall remit to the Board a levy of 3d. for every bag of maize delivered to him. A miller, acting as a registered trader and buying for his own milling directly from producers, will have to remit a levy of 6d. per bag to the Board.

This levy revenue will be used to defray the costs of administration, storage of the crop, and interest. The Board itself has passed a resolution to employ towards the same ends the special revenue accruing from the sale of its old stocks of maize at the higher price of this season. It will therefore be possible to lower the spread between producer's price and consumer's price.

Prices to Consumers.

Up to 31 August 1942 the consumer will obtain maize at a price of 15s. 7d. (free on rail, seller's station) for grades 2, 4 and 6 if not less than 100 bags are taken at once, the prices for the lower grades being correspondingly lower. The price per bag for smaller quantities will, by gradation, rise by 3d. a bag for quantities between 99 and 21 bags at a time, for quantities between 20 and 6 bags, and for quantities between 5 and 2 bags, until finally the price for a single bag will be 16s. 7d. for grades 2, 4 and 6, and 16s. 5d. for grades 3, 5 and 7.

When maize is transported by *rail* these prices may be increased by the *actual* railage *paid*, but in no case by more than 8d. a bag in the O.F.S. and the Transvaal (excluding the districts of Pietersburg, Zoutpansberg and Letaba), or by more than 1s. a bag in these three Transvaal districts and in the Cape province and Natal.

In respect of maize transported by road, the actual transport charges may be added to the price, provided that they shall in no case exceed 1d. per bag per mile, or, where a Road Motor Service is in operation, the official tariff rate of such service.

Where maize is sold on credit, interest at the rate of 1d. a bag per month may be charged for periods in excess of 30 days.

After 31 August 1942 all the prices indicated above will rise by 1d. a bag per month.

Prices for Maize Products.

In the case of maize products, a maximum price is laid down, this being a *delivered* price, free on rail, buyer's station. There is a similar rise in the price per bag by gradation as smaller quantities are taken at a time.

For No. 1 fine granulated maize meal, for instance, the price per bag of 180 lb. is 18s. when at least 30 bags are taken at a time, while it is 18s. 4d. for quantities of 29 to 11 bags, 18d. 8d. for 10 to 6 bags, 19s. for 5 to 2 bags, and 19s. 6d. for single bags. Similar price gradations are allowed for the other classes of products.

Taking as example the wholesale quantity of 30 or more bags, the prices for these other products are:—

	Per Bag.
Straight-run granulated meal	17s. 6d.
Ordinary straight-run meal	17s. 0d.
Sifted crushed mealies	17s. 3d.
Unsifted crushed mealies	17s. 0d.
Samp	23s. 6d.
Mealie Rice	23s. 6d.
Germ Meal	11s. 6d.
Hominy Chop	10s. 0d.

All these prices may be increased by 6d. a bag to buyers in the Cape Province and Natal or in the three Northern-Transvaal districts previously mentioned. The corresponding prices are, however, reduced by 6d. where no railage is involved; while similar increases as in the case of maize are allowed for road transport or credit in excess of 30 days.

As already stated, the Food Controller in no way wishes to hamper the sale of maize or maize products required for human food. In fact, his chief aim is to safeguard these food requirements. For this reason, too, the spread between producer's and consumer's price has been made smaller than it has ever been before.

The Permit System.

In the *Government Gazette Extraordinary* of 3 June, 1942, regulations were promulgated introducing a general permit system.

Under the permit system *bona fide* farmers can obtain 25 bags of mealies and mealie products without a permit until the end of June. *This includes mealie products intended for human consumption. For any quantities in excess of this quota*, whether intended for human consumption or animal feed, *the farmer must first obtain a permit.*

From the 1st July this quota of 25 bags per month, which may be obtained without a permit, will be reduced to 10 bags per month, so that *a farmer requiring more than 10 bags per month for human consumption and animal feed will have to obtain a permit* to buy the quantity he requires in excess of this quota.

As far as consumers other than *bona fide farmers* are concerned, the position is as follows: No householder can obtain more than 2 bags per month of any mealies or mealie products without a permit, whether those products are intended for human consumption or animal feed, since the permit system has been extended to cover all mealie products.

Permits for the purchase of mealies or mealie products must in all cases be obtained from the Mealie Industry Control Board, P.O. Box 669, Pretoria.

The control extended to mealie products intended for human consumption is not intended to restrict the use of these products for this purpose, but rather to safeguard supplies and to ensure an equitable distribution until our next crop is harvested.

Maintenance of Soil-Erosion Dams.

J. W. Cleghorne, Senior Soil Erosion Engineer.

THE primary function of a soil-erosion dam is to counteract and eventually prevent the ravages of soil erosion at and in the environment of the dam site. The majority of such dams consists of an unpitched earthen embankment constructed through a sloot, usually at right angles to the water flow, to effect the reclamation of a portion of the sloot by siltation and the improvement of the immediate neighbourhood by increased plant population. Many such dam embankments have been constructed throughout the Union as a result of the recent soil-erosion schemes, and it is regrettable to observe that full advantage is rarely taken to reap the maximum benefits obtainable therefrom. The owners usually consider the purpose of the embankment to have been fulfilled when that portion of the sloot wherein water is initially impounded is filled with silt. consequently attempts are seldom made to exploit the embarkment to the utmost and thus extremely beneficial possibilities of equal or even greater importance are lost.

Threefold Purpose of Embankment.

The purpose of the embankment ought to be threefold viz:—

(1) To effect siltation of the sloot combined with the establishment of vegetation as far upstream as possible;

(2) to improve the plant population for the reclamation of the sloot as far downstream as practicable; and

(3) to procure lateral improvements by re-vegetation both up- and downstream.

The silt need not only be deposited in the dam, but should be made to collect for a considerable distance upstream by the establishment in the bottom and sides of the sloot of kikuyu, couch (kweek) or other suitable grass to retard the water flow and prevent further scouring. The grass causes silt deposition every time water runs in the sloot, which silt acts as repeated top-dressings and continuously encourages the grass growth. When the dam is initially filled, the contour formed by the edge of the water should be noted as indicated by a mark made by the water . The edges of the sloot at higher levels than this contour should be sloped sufficiently to facilitate the growth of grass, shrubs, bushes and trees.

The presence of the dam, even after complete siltation, provides additional moisture in the soil downstream; in some cases there is often a trickle of water in the sloot bottom, and when several dams exist in the same sloot this trickle becomes a small stream. This seepage, which occurs underground through the sloot banks and bottom, should be utilized to improve the growth of the existing vegetation, to effect the re-vegetation of denuded areas in the sloot bottom and to ensure the life of trees which ought to be planted.

Finally, there is the reclamation of the bare patches which usually exist or are formed by the excessive soil drainage alongside the sloot. To expedite, and in many cases to make possible increased plant population, these bare patches should be serrated with plough furrows about four feet apart drawn as nearly as possible on the contour; thus is water conserved for soil penetration and seeds trapped for germination.

 [Continued on page 408.

The Moulting of Pullets.

Dr. J. J. Bronkhorst, Senior Professional Officer (Poultry), Division of Animal and Crop Production.

POULTRY farmers lose thousands of pounds annually owing to the fact that pullets go into an untimely partial or complete moult during the winter months. Although it is impossible to suggest one cause only as being responsible for this, an attempt will be made in the following article to discuss some of the chief causes, thus enabling the farmer to decide for himself what the reasons might be in his particular case.

Time of Hatching.

It is a commonly known fact that chickens which have been hatched very early are inclined to moult at the same time as the older birds. This is especially the case where heavy breeds are hatched during May and even June, and Leghorns during June and even July. The advantage of early hatching is that such chickens are reared much more easily. During cool weather chickens grow rapidly, while chicken diseases are usually absent. As a result of this rapid growth, pullets begin laying at a very early age, in most cases before the body is fully developed. Consequently, a twofold task is imposed upon the birds, namely, body building and the production of eggs. It is obvious, therefore, that unless housing and feeding conditions are more or less ideal, the pullets will not be able to stay the course. As a rule, a pullet continues laying for a while until she begins to lose body weight, then takes a vacation to restore her depleted body reserves. This vacation is usually accompanied by a partial or complete moult. All a farmer can do then is follow good methods of management.

Feeding.

Chickens grow very rapidly if they receive good rations and good treatment. A well-balanced ration provides all the requirements for maximum growth, and does not have a forcing action. Where chickens have developed very rapidly, the farmer is often alarmed when he finds that some of the pullets are beginning to lay at a very early age (4½ to 5 months). He thereupon does everything to retard their development, and immediately asserts that the ration had a forcing effect and that the quantity of meatmeal should be decreased. This is no sooner said than done. The result is that the balanced ration is upset just at the very stage when the pullet is most in need of it as she is still growing whilst laying eggs at the same time. Instead of putting on weight, she has to draw on her own system until her reserves have been exhausted, with the result that she stops laying in order to build up her body again. Consequently, when pullets start laying they should be given a well-balanced ration and not be stinted in any way. By handling pullets one can always ascertain whether the majority of them are in good condition. Upon the first sign of their losing weight, everything possible should be done to build up their body weight by supplying liberal quantities of grain, skimmed milk for drinking

and plenty of green feed, the latter preferably obtained from young, rapidly growing plants.

It should be borne in mind that the age at which a pullet lays her first egg is influenced to a greater extent by heredity than by feeding.

The Growing Period.

The growing period extends from the time the chick is hatched until it reaches its full-grown weight, and may be divided into three stages, namely, (*a*) the brooder period, (*b*) the ensuing period, until the pullets start laying, and (*c*) the period during which pullets are laying but still growing.

For the purposes of this article the second stage is of greatest importance. The most serious error committed during this period is to rear chickens on the same ground year after year. To make matters worse, the pen and run are very often too small for the number of chickens kept in them. It is then that birds run the greatest risk of becoming infected with internal parasites, of which round worms and tape-worms are probably the most important. Once hens are full-grown they are to a certain extent able to resist round worms, but this is not the case with pullets. Severely infested pullets hardly ever become profitable producers. Where the infestation is not very severe it may even pass unnoticed until the pullet enters a critical period and then breaks down. In the case under discussion this happens, of course, during the egg-producing period in winter.

All that must be done to prevent this from happening is to rear the chickens on clean ground, i.e., ground on which no fowls have been running for the two previous years. Movable chicken houses are ideal for this purpose. It should be borne in mind that treatment for worms is not really very successful and that, in any case, prevention is better than cure.

Diseases.

We now come to more direct causes. Some of the diseases mentioned below can be prevented. The case of internal parasites has already been discussed. In this connection the most serious disease is infectious coryza or roup. To combat this, the instructions of the Division of Veterinary Services should be carried out. Naturally, hens suffering from a severe attack of roup do not lay at all. Where trap-nests are used one often notices that one of the pullets suddenly stops laying. In many of these cases it will be observed that the pullet has slightly watery eyes and a nose which is somewhat moist. As a rule, a hen thus affected is also out of condition. The question of cause and effect will not be discussed here. Good housing, feeding and treatment are the most important factors for controlling colds and the resulting evils of a partial or complete moult. It is obvious that healthy pullets which are well housed and fed will be able to offer greater resistance to the organism causing the disease. The fowl-house should not be draughty, too cold or too close, and should be large enough for the number of pullets housed in it.

Chicken-pox usually causes a partial or complete moult. This disease is usually recognized by a small yellow wart which afterwards turns black. The disease can easily be prevented by vaccinating all the chickens. Vaccine is obtainable from the Officer in Charge, Allerton Laboratory, P.O. Box 405, Pietermaritzburg.

External parasites such as red mite and lice cause irritation and should be controlled. It is common knowledge that tampans are vectors of disease, and the extermination of these parasites is therefore imperative. A pamphlet dealing with the control of parasites is obtainable from the Director of Veterinary Services, P.O. Onderstepoort.

Any other disease or set-back impairing the vitality and appetite of the pullet will result in a decrease in body weight and a partial or complete moult.

Management.

The production of eggs during the winter months has been fairly well established by breeders; in other words, most hens of the high producing breeds possess the inherited characteristics of laying during winter, provided they receive correct management. Good feeding and housing have already been stressed. It is useless, however, to supply a good mash ration unless a sufficient number of mash hoppers are provided in which to feed the mash. It should also be borne in mind that for every 100 hens at least 20 feet of feeding space will be required. If the feeding space is adequate, those hens which are more nervous and timid will not be given a chance to feed, and no eggs can consequently be expected from them. Nor should the mash hoppers be so large that the feed will become stale in them. The best practice is to use hoppers which are filled with fresh mash every morning. It will be noticed how eagerly the hens will then consume the fresh mash. The feed hoppers and water troughs should be constructed in such a way that they cannot be fouled by the hens. Hygienic measures are more important than all the disinfectants which people are so ready to add to their drinking water.

Immediately after Leghorn pullets have been transferred to the laying houses, they naturally feel very nervous and strange in their new surroundings. The slightest noise is apt to send them all flying up against the roof. It is therefore advisable to treat them very carefully at this stage. Approach the house slowly, whistling as you go, to warn them of your approach. A sudden shock may result in a moult as well as other disturbances which may even prove fatal. In the case of heavy breeds, ruptured liver and internal haemorrhage are of frequent occurrence, and many of these losses may be ascribed to shock. Even when the shock is not a severe one it may possibly lead to internal disturbances with the result that the hens will cease laying.

Heredity.

So far it has been assumed that most hens possess the inherited characteristic of being able to produce eggs throughout the winter months under favourable conditions. It will be found, however, that a certain number of hens go into a moult even when conditions are as favourable as one can make them. Such hens do not possess the inherited character of laying eggs in winter but, as a rule, are good spring and summer producers. If such hens have a healthy appearance, it is not necessary to cull them, but they should be marked with a coloured leg-band to proclude the possibility of their being included in breeding pens at a later stage.

Treatment of Pullets in a Moult.

It should be clear by now that there are many factors responsible for a partial or complete moult, and that the wisest course in the

treatment of fowls is naturally the elimination of the cause if that can be ascertained. The best treatment for pullets beginning to moult is to isolate them in small pens, and in this way remove them from the competition existing in the flock. By doing this, a complete moult may be avoided and the pullet will still be able to lay a sufficiently large number of eggs to show a profit. Single-pen hen batteries are very suitable for this purpose. It is realized, however, that on most farms small pens of this type are not available. If moulting pullets can be isolated, it will be possible to give them special attention. A wet mash, skimmed milk, and succulent green feed or sprouted grain will be very effective in reducing to a minimum the period during which a pullet is out of production.

Winter Feed for Pregnant Ewes.

P. D. Rose, Lecturer in Sheep and Wool, Grootfontein College of Agriculture, Middelburg, C.P.

PROVISION is often made for extra feeding at "lambing time" but it is not generally realized that the ewe needs this extra care during pregnancy as well, since the ewe's condition at this time has a profound influence on her offspring. These remarks apply with special reference to grassveld areas where spring lambing is practised, and where the ewes, therefore, carry their lambs during the leanest part of the year.

The feeding of the young animal should begin during pregnancy and a liberal supply of protein and mineral matter, especially lime and phosphates, should be supplied to the pregnant ewe. These minerals, which are essential at all times, are particularly necessary at this stage for the development of the body tissues and skeleton of the foetus. The mother is able to protect her offspring to a limited extent against small mineral deficiencies in her food by drawing on her own skeleton for the lime and phosphates, and on her muscular tissue for the protein necessary to the growing foetus, but such maternal sacrifice is made at the expense of her own body, lowering her vitality and adversely affecting the milk supply. If the food supply is too poor, both mother and foetus suffer.

Provision should, therefore, be made for winter feed, supplemented by licks, in order to ensure that strong, healthy lambs will be dropped and that both mother and lamb will be able to make the best use of the new spring grass.

GOVERNMENT GUANO.

IT IS notified for general information that owing to conditions over which there is no control, the yield from the Government Guano Islands has been so low that there is no Guano available to make a second allotment this year.

The Farm Home.

(A Section devoted mainly to the interests of Farm Women.)

Salads.

Miss H. H. Meyer, Home Economics Officer, College of Agriculture, Glen.

SINCE salads are pleasing to the eye, palatable to the taste and, in addition, contain very valuable nutrients, they should occupy an important place on the menu.

Salads may be prepared from various ingredients, e.g., meat, fish, vegetables (raw or cooked) and fruit, with or without a salad dressing. For this reason, therefore, a salad may be used either as one of the main dishes of a meal or as a side-dish. The salad which is to be used with the main dish, however, occasions the housewife the most worry, and this article will, therefore, deal more particularly with the preparation of salads of this type.

The Essentials for a Good Salad.

In order to prepare successful salads there are certain essential points to be borne in mind:—

(1) Special attention should be paid to the ingredients to be used. The vegetables or fruit, and especially the lettuce leaves, should be fresh and crisp. Wilted lettuce leaves spoil the appetite and are not wholesome.

(2) When cutting fruit or vegetables use a sharp knife to avoid bruising them, especially in the case of lettuce leaves. Wash the leaves, allow to drain on a clean cloth, then pile up lightly, and using a sharp knife cut right through the heap, slicing the leaves into thin strips without bruising them.

(3) The material to be used must be absolutely clean. This point cannot be stressed too strongly since it is of the utmost importance. If lettuce leaves are not thoroughly washed there is a risk of snails or insects finding their way into the system. The most effective method of washing lettuce leaves is to separate them from the head, leaving them in cold water for a few minutes and then rinsing in a weak solution of salt water just before serving. Do not leave the leaves in the salt water for long, however, since that will cause them to wilt. A little lemon juice in the water helps to make the leaves fresh and crisp. This is also effective in the case of celery and parsley.

(4) The material to be used for the salad must be quite dry before being mixed with the salad dressing. When juicy vegetables or fruit are combined with a salad dressing, the dressing will become diluted, and where oil has been used for the dressing it will be separated from the other ingredients of the dressing. The juice which

regulate the functions of the body and help to build up resistance

drains from the vegetables may be used in soup or in a meat gravy, whereas that obtained from fruit may be transformed into delicious cool drink.

(5) The salad should be prepared in as interesting a way as possible; consequently, colour plays a very important part. Colourfulness can be achieved by garnishing the salad with parsley, celery, tomato slices, slices of hard-boiled egg, sliced cucumber, pickled olives cut into slices, or a sprinkling of Cayenne pepper.

(6) The nutrients in the salad should always be taken into account, and salads should, therefore, be chosen with a view to supplementing the necessary food substances in the diet.

If all these points are borne in mind, the housewife will pay more attention to the preparation of salads, and her family will derive greater benefit and pleasure from such dishes. Mothers are frequently heard complaining of the poor appetite of their school-going children. One cannot, however, expect children to have any inclination for a plate of steaming hot food after they have spent five hours sitting in school and, in addition, have had to travel a long distance home in the broiling sun. The mothers of such children should, therefore, make much greater use of salads. The same food which was intended for hot consumption may be served in the form of cold salads. In this way a greater variety of nutrients can be introduced into the diet, especially with raw vegetables. The more frequent use of salads would not only save the housewife a great deal of time and energy, but would also make it unnecessary for her to spend so much of her time in front of the stove, especially during hot weather.

Nutritive Value.

The nutritive value of a salad depends largely on the variety of vegetable or fruit which is used. If vegetables with a low calorie content such as, e.g., raw grated cabbage, are used for the main dish, they should be combined with some other vegetable, or with fruit or nuts and a rich salad dressing in order to make the dish more nutritive. A light salad should be served with a rich meal, whereas a richer or more nutritive salad should be provided with a light meal. Because of this the housewife should, therefore, have a knowledge of the nutritive value of vegetables and fruits which are rich sources of minerals and vitamins.

Vegetables.—Leafy vegetables such as lettuce, cabbage, spinach, beetroot leaves, celery and parsley are exceptionally rich in calcium, iron and vitamins A and C. The dark-green leaves of lettuce or cabbage are richer than the white inner leaves. Yellow and green vegetables such as carrots, yellow mealies, green beans, etc., are rich in vitamin A. Tomatoes, potatoes and sweet peppers are excellent sources of vitamin C. Dried beans and peas, soybeans and other legumes contain proteins which are muscle-building. Potatoes, sweet potatoes, mealies, dried peas and beans, lentils, beetroot and carrots contain starch and sugar and are, therefore, good energy-giving foods.

Fruit.—Apricots, yellow peaches, mangos and pawpaws are rich in vitamin A. Citrus fruits are the best source of vitamin C. Dried fruits are good sources of iron.

From the foregoing it will be clear that vegetables and fruit are largely responsible for introducing into the diet the vitamins and minerals essential for good health. They promote growth,

against disease. Very often the difference between negative good health which is merely the absence of disease, and positive, radiant good health can be ascribed to the quantity of vegetables, fruit and milk consumed daily.

Raw vegetables and fruit are of greater value than when cooked, since some of the vitamins are destroyed and some of the minerals become dissolved and are lost during the cooking process. Raw vegetables in a salad dish also look more attractive and refreshing.

Nuts and dried fruits, such as raisins, currants, saltanas, seeded dates, seeded and soaked prunes, dried figs, slightly soaked peaches, etc., make a very palatable combination with such vegetables as, for example, raw grated carrots or raw grated cabbage and tomatoes, and are greatly relished by children. Nuts make a delicious combination with a potato salad. Not only do these dried fruits and nuts make a salad more attractive, but they also considerably increase its nutritive value.

Any kind of fresh fruit or even canned fruit combined with vegetables makes a delicious salad. Pineapple cut into cubes, apples cut into cubes or grated, sliced banana, orange sections, delicious ripe yellow peaches cut into slices, apricots, grated quinces and pears, as well as canned pineapple, peaches, quinces or pears, together with vegetables and a salad dressing will be found irresistible. These combinations are interesting and palatable and increase the nutritive value of the dish.

A salad is much more attractive when served with a dressing instead of slightly diluted, sweetened vinegar. This will also be much more nourishing since most salad dressings are prepared with milk, cream or eggs. An acid is necessary in most salad dressings and lemon juice is preferable to vinegar. An oil is sometimes used in preparing salad dressings; for this purpose olive oil or a vegetable oil will be found most suitable since this has the least taste, but many people prefer salad dressings without oil.

When a salad dressing is used with a salad, it is best to add the dressing just before serving the salad. This will be found advisable especially in the case of salad dressings containing oil, since the oil is liable to separate. For the same reason it is essential that all the ingredients should be quite cold before being mixed.

A Few Recipes.

The following are a few interesting recipes for cool and refreshing, as well as nourishing, salads:—

TOMATO SALADS.

6 medium-sized tomatoes.
1 ripe apple.
A little cream salad dressing.
2 T. finely chopped parsley.
1 c. grated raw carrots.
Salt and pepper.
A few whole or sliced lettuce leaves.

Arrange the tomatoes on the lettuce leaves in a glass plate or dish. Cut the tomatoes into quarters without cutting quite through. Mix the carrots and grated apple. Add the parsley, sprinkle with a little salt and pepper, and mix with sufficient salad dressing to bind the mixture. Fill the tomatoes with the mixture and garnish with the parsley.

CREAM SALAD DRESSING.

½ c. whipped cream.
2 T. lemon juice or vinegar.
Pinch of pepper.
½ t. salt.
½ t. mustard.
1 t. sugar.

Mix the dry ingredients with the vinegar or lemon juice and add to the cream gradually, beating constantly.

N.B.—Sour cream may be used in which case the addition of an acid will not be necessary.

STUFFED BEETROOT SALAD.

6 medium-sized cooked beetroots.
1 small pineapple.
2 T. finely chopped parsley.
A little salt and pepper.
A little cream salad dressing.
A few lettuce leaves.

Scoop out the beetroots and arrange on the lettuce leaves in a glass dish. Cut the scooped out portions into cubes and mix with the pineapple, also cut into cubes, and the finely chopped parsley. Add enough salad dressing to bind the mixture, and fill the beetroots. Garnish with sliced radishes, or small lettuce leaves.

N.B.—During the fruit season, ripe yellow peaches may be used instead of pineapple. Canned peaches may also be used as a delectable variation.

GREEN BEANS AND CABBAGE SALAD.

2 c. cooked beans, shredded or cut lengthwise.
1 c. raw grated cabbage.
1 large orange.
Salt and pepper.
Boiled salad dressing.
A few shredded lettuce leaves.

Take a small head of cabbage, cut in half, and remove the core of one half, leaving the outer leaves in the form of a shell. Cut up the scooped out portion finely and add to the green beans. Peel the orange thickly, cutting away all the white, and remove the quarters by separating them from the white membranes. Add to the vegetables. Add a little salt and pepper and mix with a sufficient quantity of salad dressing. Place the salad in the shell made from the cabbage head and place in a glass dish. Garnish with lettuce leaves and slices of hard-boiled egg.

BOILED SALAD DRESSING.

1 t. salt.
1 t. mustard.
1 t. sugar.
A little cayenne pepper.
1 T. flour.
1 whole egg or yolks of 2 eggs.
1½ T. butter.
¾ c. milk.
¼ c. vinegar.

Mix the dry ingredients, add the melted butter and slightly beaten egg. Add to the heated milk and boil slowly, stirring until the mixture is cooked. Remove from the stove and beat the mixture well. Add the vinegar gradually, beating constantly.

N.B.—This salad dressing will keep for a long time if bottled when cold and stored in a cool place.

POTATO SALAD.

6 medium-sized boiled potatoes.
4 small radishes cut into slices, or 2 T. chopped raw onion.
Boiled salad dressing.
½ c. chopped walnuts.
1 large apple cut into cubes.
Salt and pepper.

Cut the potatoes into cubes or slices. Add the apple and other ingredients. Sprinkle with a little salt and pepper and mix with sufficient salad dressing to moisten. Place in a glass dish, spread a little of the dressing over the top and garnish with parsley and slices of hard-boiled egg.

CARROT AND CABBAGE SALAD.

1 c. raw grated carrot.
1 c. raw grated cabbage.
1 banana.
1 T. lemon juice.
¼ c. finely cut seeded raisins or dates.
Shredded lettuce leaves.
A little boiled salad dressing.

Add the raisins or dates to the carrots and bind with a little salad dressing. Cut the banana into slices, over this pour the lemon juice, and mix with the cabbage and some salad dressing. Place the lettuce leaves in the bottom of a glass dish, and on this arrange the cabbage and carrots in rows. Garnish with parsley.

JELLIED VEGETABLE SALAD.

1½ T. gelatine.
3 T. cold water.
1 c. boiling water.
1 t. salt.
3 T. sugar.
A little cream salad dressing.
¼ c. vinegar or lemon juice.
1 c. cooked beetroot cut into cubes.
1 c. grated raw carrots.
1 c. grated raw cabbage.
½ c. boiled peas.
Shredded lettuce leaves.

Soak the gelatine in cold water and dissolve in the boiling water. Add the seasoning and allow to melt. Add the beetroot while the mixture is still warm in order to extract the red colouring matter. Allow the mixture to cool until it begins to set. Stir well and add the remaining vegetables with the exception of the lettuce leaves. Allow to set, turn out on to the shredded lettuce leaves, and serve with cream salad dressing.

Agro-Economic Survey of the Union.

The Irrigation Areas on the Slopes of the Northern Plateau

(Comparison of Areas 2A, 2B and 2C).

Compiled by Dr. J. F. W. Grosskopf and G. J. C. Uys,
Division of Economics and Markets.

THE territory comprising these three areas lies to the north of the great watershed running north-east from the Witwatersrand through Johannesburg-Bethal along the Breyten railway and westwards through Koster in the direction of Ottoshoop (between the eye of Malmani and eye of Malopo). This ridge, bounded on the south by the high plateau where dryland cultivation is the rule (Areas 1 A to 1 G) forms the great watershed between north- and east-flowing rivers which flow into the Limpopo and so to the Indian ocean, and the south- and west-flowing rivers which join the Orange River and so flow into the Atlantic Ocean. From an agricultural point of view this watershed is important since it constitutes in the main the northern limit of woolled-sheep farming and, as far as the interior is concerned, the southern limit of tick-borne stock diseases, such as heartwater, and of human diseases such as bilharzia and malaria. In the east, this area is bounded by the Drakensberg range and in the west by the irrigation valleys along the upper reaches of the Klein Marico River. (See map.)

Irrigation Areas Demarcated.

The following areas are demarcated in the map:—

1. *The Western Transvaal Irrigation Area* (2 A) situated more or less between Zeerust and Pretoria. The southern boundary is the easily discernible edge of the relatively flat plateau where the sudden drop to the lowveld begins. The northern boundary lies in the lowveld and includes the most important irrigation areas. This latter boundary is determined more by the use to which the soil is put, than by natural transitions. The area as such is, therefore, subject to modification, as for example, in the event of a further extension of irrigation schemes towards the north.

2. *The Sourveld* (2 B). Along the southern boundary of this area there is no noticeable difference in altitude, since the type of soil is the only determining factor. In the north, the boundary is determined by the irregular transition to lowveld which, in some places shows the typical "bankeveld" characteristics. In the east, this sourveld ends where a transition of soil and veld types has been brought about by the Drakensberg watershed (with its spur, the Bothasberg).

3. *The Eastern Transvaal Irrigation Area* (2 C). This area comprises the valleys which the Steelpoort, Spekboom, Ohrigstad and Crocodile rivers and their tributaries, as it were, carved out of this terminus of the Drakensberg. The encircling ranges therefore, at almost all points form the boundaries of these irrigation valleys.

Altitude and Topography.

As has already been described, the southern boundary of the entire irrigation area is formed by the inland plateau and the Drakensberg range, with the result that the altitude of this boundary is seldom less than 5,000 ft. above sea level.

In the *Western Transvaal Irrigation Area* (2 A) and the *Sour Highveld* (2 B) the considerably lower northern boundary is under 3,500 feet only in the valleys, whereas, in some parts of the *Eastern Transvaal Irrigation Area* (2 C), it's altitude is even less than 2,000 ft. The surface characteristics of the *Western Transvaal Irrigation Area* (2 A) are determined by the rapid drop from the highveld. Along the southern boundary the country is of a broken nature, hilly and full of ravines, but gradually flattens out towards the north. The Magaliesberg range forms a wall extending from the east through approximately half the length of this area. The northern portion of this area is relatively flat, except for the isolated Pilandsberg. The outstanding characteristic of the *Eastern Transvaal Irrigation Area* (2 C) is its irrigable river valleys. This area naturally, however, also includes the unirrigable and, for the most part, untillable hills which lie between these rivers and spruits. In contrast with the abovementioned two areas, the *Sour Highveld* (2 B), as its name indicates, has a typical highveld appearance with undulating grass ridges, particularly towards the north. Along the banks of the Wilge and Olifants rivers and also along the southern boundary, the surface becomes more irregular.

Rainfall.

These Transvaal Irrigation areas lie within the summer rainfall area (October to March) in which the precipitation occurs mainly in the form of thunderstorms, sometimes accompanied by hail. Over the greater part of the *Sour Highveld* (2 B), to the south of and above the "banke", the annual rainfall averages between 25 and 30 inches. This higher rainfall belt extends through the *Western Transvaal Irrigation Area* (2 A) and along the higher-lying Magaliesberg range and the Pilandsberg. In the greater part of the latter area, however, the rainfall is only 20 to 25 inches per annum. The average annual rainfall of the low river valleys of the *Eastern Transvaal Area* (2 C) does not exceed 20 inches, but rapidly increases with an increase in altitude towards the mountains. On account of the heat, the rate of evaporation in summer is very high in this area, especially on certain types of soil, with the result that the effects of a drought very soon become noticeable.

Irrigation.

The name given to the three areas discussed here, indicates that irrigation plays an important part in the farming system. As is often the case along the margin of a plateau, springs are plentiful in this area. In many cases the spruits and rivers drain subterranean sources with the result that they are more or less perennial. In the *Western Transvaal Irrigation Area* (2 A), however, a number of large irrigation dams have been built where rivers cut through the Magaliesberg and other mountain ranges. Examples of such dams are the Marico, Olifantsnek, Bospoort, Hartebeespoort and Bon Accord dams. In the *Sour Highveld* (2 B) irrigation is carried on in a small way along the banks of spruits and in the valleys and depends on springs which usually emerge in low-lying areas In the *Eastern Transvaal Area* (2 C) the spruits and rivers are fed by mountain streams which are in turn diverted to irrigate the low-lying alluvial soils.

Temperature.

With decreasing altitude, the entire territory becomes warmer towards the north. In this area, therefore, both highveld and

lowveld temperatures are experienced. The greater part of the *Sour Highveld* (2 B) is unsheltered and lies at a high altitude, with the result that it is, for practical purposes, exposed to the same winter cold and frost as the rest of the Transvaal highveld. Mountain ranges, such as the Magaliesberg, provide good protection against cold winds, and their northern slopes are often frost-free. The bushveld part of the *Eastern Transvaal Irrigation Area* (2 C) is the lowest-lying and also the warmest, but even there fairly low temperatures are recorded during winter nights. Cold winds from across the Drakensberg and the southern plateau, sometimes cause unseasonable cold spells which adversely affect the grain crop during spring.

Soil Types.

The *Western Transvaal Irrigation Area* (2 A) comprises a great variety of soil types. Of most importance to agriculture is undoubtedly the rich lime-saturated, black, clayey loam types known as "black turf" found especially in the valleys to the north of the Magaliesberg and also in vleis and along small streams. Wheat and tobacco are extensively cultivated under irrigation on this type of soil. A sandy, gravelly quartzite soil occurs mainly along the northern slopes of the Magaliesberg, but it is deficient in plant nutrients although important for citrus growing. The ridges between the black turf flats are generally covered with poor, sandy soil. Red loam and clayey loam soil types also occur in scattered localities, especially in uneven and hilly areas, and are preferred for dry-land cultivation since they are more fertile and have a higher water-retaining capacity than the sandy soils. For the same reason, these soils do not require as much water as the black turf soils. Shale soils are also found at some places.

The preponderating soil type of the *Sour Highveld* (2 B) is a light greyish, sandy soil derived from Waterberg sandstone. It is deficient in minerals and humus and is very shallow, with layers of "ouklip" or yellow pot-clay as a substratum. Gravelly quartzite soils and stony dolomite soils also occur in this area. For the most part, these soils are unsuitable for crop-raising purposes and also provide poor pasturage. Grey to black clayey loam soil, fairly fertile, occurs on low-lying ground. Isolated patches of red clayey loam on the ridges, derived from ironstone outcrops (diabase, norite and dolerite) are more fertile than the predominant ridge soil types.

The arable soils of the *Eastern Transvaal Irrigation Area* (2 C) consists mainly of alluvial soils, deposited in the low-lying places (usually along watercourses). These soils, therefore, differ considerably as regards depth and composition. In the valleys the soil is usually a grey to black or red clayey loam of fair depth, but against the slopes of the surrounding hills this soil becomes shallower and more gravelly, finally giving way to rock.

Vegetation.

The veld types of the *Eastern Irrigation Area*, situated along the boundary zone between the lowveld and the highveld, range from true grass-veld to Transvaal bushveld. Topographically a large part of the *Sour Highveld* (2B) must be classified as highveld (as already described) and is therefore also true grass-veld although the grass is inferior and sour owing to poor soil. As a rule, grazing is of value only for three to four months during spring, after the young grass has sprouted in burnt areas.

Here, as well as on the poor sandy or stony soil of the other two irrigation areas, a large variety of grass types is to be found. They

are, however, either unpalatable as in the case of turpentine grass (*Cymbopogon*), gum grass (*Pogonarthria*), " bitterpyl " and others, or soon become hard and unsuited fro grazing, as in the case of thatch grass (*Hyperrhenia*), " *suurpol* " (*Elyonurus*), *Heteropogon, Andropogon*, Natal Red Top (*Rhynchelytrum repens*), oat-grass (*Monocymbium*), stick-grass varieties (*Aristida* varieties) and *Eragrostis* varieties like " taaipol " (*E. plana*). On the more fertile soils, especially the black turf soils of the *Western Irrigation Area*, the veld is much sweeter and the following grasses predominate, viz., red grass (*Themeda triandra*), finger grass (*Digitaria*), buffalo-grass (*Panicum*) and the shorter and sweeter *Eragrostis* varieties. The Karoo thorn tree (*Acacia karroo*) grows on the more fertile soils (especially those derived from ironstone) and is a sure indication of sweeter veld. The " kaffer-wag-'n-bietjie " (*Acacia caffra*), " blink-blaar-wag-'n-bietjie " (*Zizyphus mucronata*) and karree (*Rhus lancea*) grow on this as well as on sourer veld, while South African beech (*Faurea saligna*), wild syringa (*Burkea africana*) and " dikbas " (*Lanea discolor*) amongst others, are characteristic of the sandy ridges. On the sour quartzite ridges, proteas (*Protea abyssinica*) are generally found growing on the southern slopes, while aloes, on the other hand, grow mainly on the dry sunny side of ironstone ridges. The picturesque " naboom " (*Euphorbia ingens*) is also to be found against hot dry slopes.

In addition to the abovementioned plants, such usually inedible or poisonous shrubs as " elandsboontjie " (*Elephantorrhiza Burchellic*), " goorappel " (*Pachystigma Zeyheri*), etc., are also abundant in this area. Of the prisonous plants which cause serious stock losses, the most important are " gifblaar " (*Dichapetalum cymosum*), which is usually confined to the northern slopes of certain ridges, and " gousiektebossie " (*Vangueria pygmaeum*). The latter is most common on the *Sour Highveld* (2 B)

Diseases and Pests.

The occurrence of " gallamsiekte " and " stiff-sickness ", which are caused by a phosphate deficiency in the soil and consequently in the grazing, bears a direct ratio to the poorness of the soil. Tick-borne diseases, such as heartwater, are prevalent mainly in the warmer areas. Horse-sickness is severe everywhere in this area.

The irrigation areas are unhealthy for sheep (especially merinos), owing to their hot climate, lowveld diseases and unsuitable pasturage. This applies particularly to the *Sour Highveld* (2 B) on account of its poor grazing. The poisonous plants have already been discussed. Witchweed (*Strigea lutea*) which grows as a parasite on the roots of maize and other plants, is a common pest on sandy soil. Other weeds of cultivated lands are the more or less widely distributed varieties which are not confined to certain areas, such as wild oats in wheat fields, cocklebur, thornapple, khaki-bush, etc.

Farming Systems.

The system of farming is determined mainly by the availability of irrigation water and the suitability of the soil for certain trees or crops. In the *Western Transvaal Irrigation Area* (2 A), the quartzite soils under irrigation are used for citrus-growing, while the other types under irrigation are used mainly for the cultivation of tobacco and wheat. In the case of tobacco and wheat farming also there is a marked difference between the private irrigation farmers and the Government settlers who usually farm on smaller plots with very limited capital. There are, however, large areas where irriga-

tion water is very scarce or not available at all, and here the principal enterprise is cattle farming, combined with dryland crop farming. The greater part of the *Sour Highveld* (2 B) is devoted to crops under irrigation (mostly wheat); but in the south-east especially, there is a decrease in irrigation farming with a corresponding increase in dryland farming. On many farms, however, the yields derived from crops as well as stock are so small that the farmer can only just manage to provide for his own needs, with very little cash income. In the *Eastern Transvaal Irrigation Area* (2 C), farming systems also vary, owing mainly to the geographical differences between the "Rooi-moot" (situated between the Bothasberg and Steenkampsberg), the higher valleys of the Crocodile and Dorps rivers, and the low-lying Lydenburg bushveld. In the "Rooi-moot", the differences in the farming systems are due primarily to the original methods of settlement. These differences are evident today in the methods practised by settlers on the "Mapochs gronden" and the Lagersdrift church settlements, and by private farmers.

Land Utilization.

The average size of farms is 238 morgen in the *Western Transvaal Irrigation Area* (2 A), 554 morgen in the *Sour Highveld* (2 B), and 556 morgen in the *Eastern Transvaal Irrigation Area* (2 C). These average figures, however, give no indication of the great disparity which actually exists. The average size, for example, of 26 dryland farms in the *Western Transvaal Irrigation Area* (2 A) is 525·5 morgen, as against the average of 39·3 morgen occupied by 49 Government settlers. The private irrigation farms, of which 222 were visited, have an average size of 252·1 morgen, and 29 citrus farms average 212·2 morgen. The largest farms in the *Eastern Irrigation Area* (2 C) are situated in the Lydenburg bushveld (average 791 morgen). In this area, too, the acreage under irrigation, per farm, is largest viz., 61 morgen (8 per cent.) as against 32 morgen (9 per cent.) in the Crocodile and Dorps rivers area, where the average size of the farms is 344 morgen. The average "Rooi-moot" farm is 372 morgen in extent with 23 morgen (6 per cent.) under irrigation. The average of lands under irrigation in the *Sour Highveld* (2 B) is 11 morgen (2 per cent.) per farm. The position in the *Western Transvaal Area* (2 A) may be summarized as follows: private irrigation farms, 11 morgen (4 per cent.); citrus farms, 14 morgen (7 per cent.); government settlements, 12 morgen (30 per cent.). In the last-mentioned group there is practically no dryland cultivation, in contrast with the dryland farming group where the average area under dryland cultivation is 60 morgen per farm. Citrus farms in this area have an average of 11 morgen of dry lands, and private irrigation farms, 15·1 morgen. On the *Sour Highveld* (2 B) the average area under dryland cultivation is 40 morgen as against 21·4 morgen in the *Eastern Transvaal Irrigation Area* (2 C). In these two areas, farm labourers receive an average of 14 morgen of land for cultivation, this usually consisting of inferior high-lying ground. In the *Western Transvaal Irrigation Area* (2 A) native lands average considerably less (4 morgen per farm for the whole area). Citrus farmers seldom allow their natives the use of land in part payment of wages; and government settlers practically never. Much of the grazing in the *Sour Highveld* (2 B) consists of old lands. After the poor soil on the ridges has been cultivated for a few years the yields begin to dwindle and the exhausted lands are abandoned. The grazing which then grows on the soil is of very poor quality.

Farm Values.

In all three irrigation areas the most valuable soil is that which can be brought under irrigation. The value of irrigable land is determined largely by the monetary value of the crops raised on it. Since this varies considerably according to the quality of the soil, its water supply, the danger of frost, the type of product which can be produced and the price obtained for it, and transport facilities to a market, it is clear that the values of land under irrigation must also differ widely in different localities. In the case of the average farm, however, pasturage, dryland and fixed improvements in different ratios, also influence the value of the land. It is, therefore, evident that prices will vary from farm to farm. In the *Western Transvaal Irrigation Area* (2 A) the dryland farms have the lowest value, viz., £1·8 per morgen, whereas in the case of the irrigation groups the value is more or less in direct relation to the percentage of land under irrigation, as the following values per morgen and percentages will indicate: Private irrigation farms, £5·0 (4 per cent.); citrus farms, £9·8 (7 per cent.); government settlements, £13·4 (30 per cent.). In the *Sour Higveld* (2 B) the figures are: £2·3 (2 per cent.). In the *Eastern Irrigation Area* (2 C), the position is as follows: "Rooi-moot", £3·9 (6 per cent.); Crocodile and Dorps rivers areas, £5 (9 per cent.); Lydenburg bushveld, £3·5 (8 per cent.). It appears, therefore, that land values are lower in the *Eastern Irrigation Area* (2 C), which is far removed from the large markets and where mainly wheat is produced, than in the *Western Area* (2 A) where such products as tobacco and citrus produce a higher income per morgen.

In the *Western Transvaal Irrigation Area* (2 A), the value of improvements is highest on the citrus farms, averaging £609 per farm, followed by the private irrigation farms with £370 per farm. That the government settlers and dryland farmers usually have a poor type of building and few improvements, is apparent from the low value of improvements, viz., £155 and £187 respectively. In the *Sour Highveld* (2 B), most of the farm dwelling-houses are also of a poor type and many farms are not fully fenced. The value of improvements in this area averages £349. Lydenburg bushveld shows the highest improvement value, viz., £761 per farm. The value of improvements in relation to total value varies from 20 per cent. to 30 per cent. for the various groups.

Crops.

The most important products of the area, viz., wheat, tobacco and citrus, are dependent on irrigation. Maize is the principal dryland crop although it is also planted as a rational crop under irrigation.

As has already been mentioned the lighter ridge soil which are mostly poor and sandy, are used mainly for dryland cultivation. The phosphate deficiency of these dry lands is usually supplemented by the application of superphosphate. Although the low-lying patches which are generally put under irrigation, are usually more fertile, the continuous cultivation and irrigation drains the soil of plant material and weakens its structure. Applications of kraal manure together with fertilizer, therefore, have a very beneficial effect on such soils, and all the available kraal manure is usually applied. Farmers who have cattle or sheep obtain manure by keeping their stock in kraals during the night, but settlers and small vegeta-

ble farmers near the cities usually have to buy manure. Green-manuring is seldom practised and then only on a small scale under irrigation.

On the whole, dryland crops produce very low yields in this area. Even under irrigation the yields of such crops as wheat leave much to be desired. The result is that the yield on many of the small farms with limited area for cultivation are so small that most of it is consumed on the farm itself.

Table I shows the average area under crops for the three irrigation areas.

Maize.—As far as area is concerned, maize comes first, except in the *Eastern Transvaal Irrigation Area* (2 C) where wheat is the principal crop.

TABLE I.—*Area under crops; average per farm for three Transvaal Irrigation areas.*

	Western Transvaal		Sour Highveld.		Eastern Transvaal.	
—	Morgen.	%	Morgen.	%	Morgen.	%
Maize	12·6	52·3	27·4	65·7	17·6	30·4
Wheat	6·6	27·4	6·7	16·1	28·2	48·7
All fodder crops	0·5	2·1	5·8	13·9	7·4	12·7
Tobacco	2·3	9·5	—	—	—	—
Fruit	1·0	4·1	—	—	—	—
Vegetables	0·5	2·1	0·3	0·7	—	—
Other	0·6	2·5	1·5	3·6	4·7	8·2
TOTAL	24·1	100·0	41·7	100·0	57·9	100·0

The *Sour Highveld* (1 B), has the largest area per farm (27·4 morgen) and also the largest percentage of lands per farm, (65·7 per cent.) under maize. In comparison with the average farm area of 554 morgen, the cultivation of maize is on a very small scale, which can be attributed to the poorness of the ridge soil. The average yield is consequently only 133 bags (4·9 bags per morgen) of which 58 per cent. is sold, 24 per cent. used for feeding purposes and 19 per cent. used in the home, for labourers and for seed. It is noteworthy that the yields of farms under 200 morgen in extent is only 3·4 bags per morgen; this increases gradually in relation to the increase in the size of the farms so that farms of over 800 morgen have a yield of 5·7 bags per morgen. It may be a lack of capital and of knowledge regarding fertilizing and correct methods of cultivation which handicaps the small farmer. In the "Rooi-moot" and the Crocodile and Dorps rivers area of the *Eastern Transvaal Irrigation Area* (2 C), the morgenage under maize, although not very extensive, exceeds that under wheat. The yield in these two sub-areas is 5·6 and 6·9 bags per morgen respectively, while it amounts to 8·1 bags in the more fertile soil of the Lydenburg bushveld. In the *Western Transvaal Irrigation Area* (2 A), maize-growing is most extensive on the dryland farms although the yield is only 4·8 bags per morgen; chiefly on account of the precarious rainfall and partly also on acccount of the poorness of the soil.

On irrigation farms the cultivation of maize usually occupies a subordinate position.

Wheat.—It has become practically a tradition with farmers in the interior to cultivate wheat under irrigation where at all possible. Throughout the entire irrigation area, wheat is consequently also the winter crop on irrigation lands although citrus and tobacco are of greater importance in certain parts of the Western Transvaal.

The largest average areas per farm under wheat are found in the *Eastern Transvaal Irrigation Area* (2 C), and in this area again the Lydenburg bushveld sub-area has the largest relative areas under wheat, viz., 45 morgen per farm. The average wheat yield per morgen is lower than may be expected from wheat cultivated under irrigation, viz:—Sour Highveld (2 B), 5·4 bags; *Western Transvaal Irrigation Area* (2 A), 7·2 bags; *Eastern Transvaal Irrigation Area*, 9·7 bags. This tendency for the yield per morgen to be smaller in the case of small farms than in the case of large farms, was also noticed in the case of wheat in a uniform area such as the *Sour Highveld.*

Tobacco.—Except on the quartzite soils, tobacco is preferred as a summer crop under irrigation in the *Western Transvaal Area* (2 A). It is, however, cultivated on a relatively small scale, mainly because it requires much labour but also since crop rotation is necessary to avoid diseases on the limited areas available. Most farmers therefore cultivate only a few morgen of tobacco, especially of the Virginia type, and make increasing use of flue-curing in order to obtain tobacco of good quality and colour. A little air-cured tobacco is also produced in the Lydenburg bushveld.

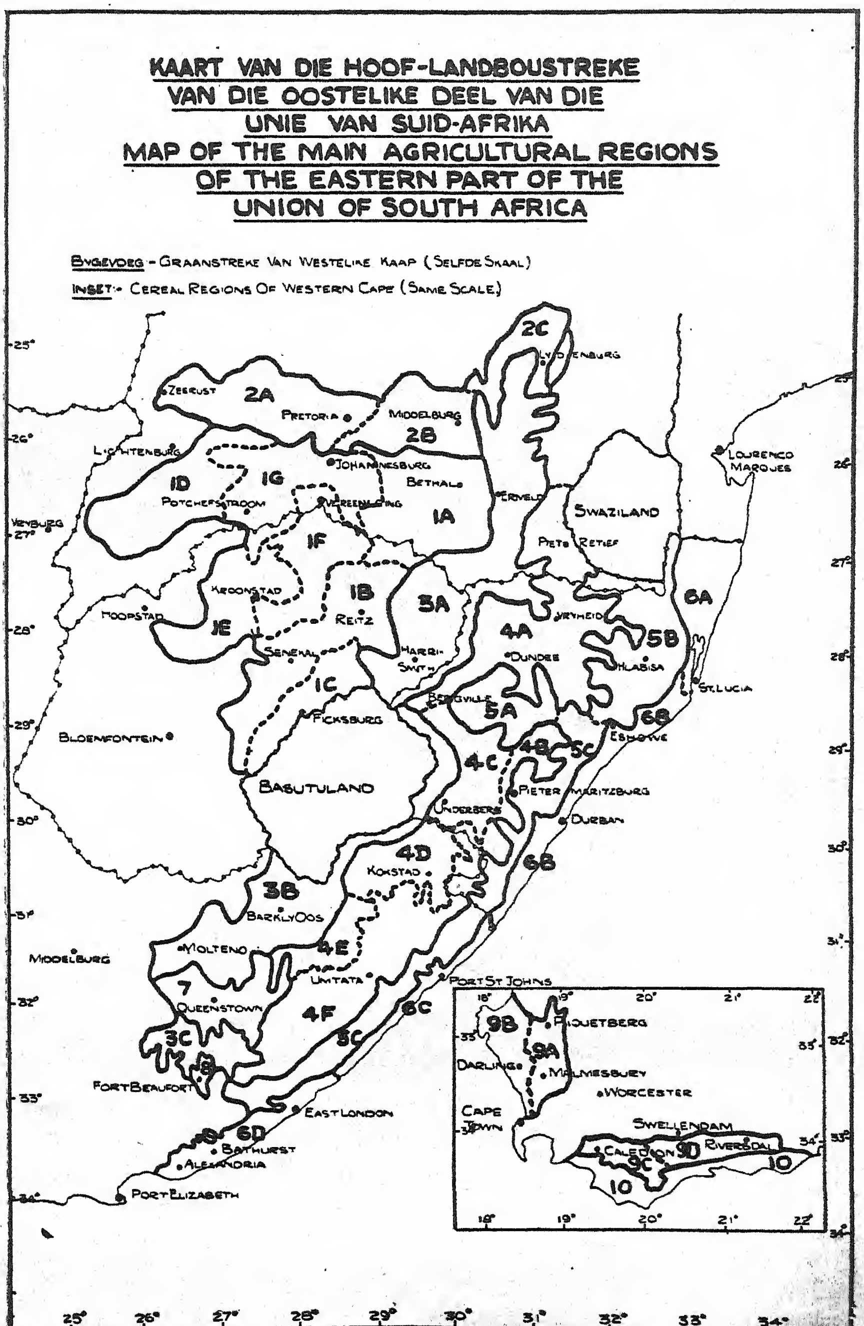
Citrus.—The citrus farmers of the *Western Area* (2 A), have an average of 7·6 morgen under fruit trees, mainly citrus. It seems, however, as if citrus farming in this area is declining on account of low profits, and is consequently losing its importance in comparison with other citrus areas. Other sub-tropical fruits, such as avacados, mangos and paw-paws, are produced on a small scale in a few localities.

Other Crops.—Cotton is cultivated on a small scale in the Lydenburg bushveld where a moderate amount of *brewer's barley* is also produced. Teff is grown mainly in the *Sour Higveld*, as hay for winter feed, while *oats* are sown in the *Eastern Transvaal Irrigation Area* (2 C). *Vegetables, potatoes, sweet potatoes* and *flowers* are produced under irrigation in the neighbourhood of Pretoria and Johannesburg. *Potatoes* and *beans* are, however, also produced in the *Eastern Transvaal Irrigation Area.*

TABLE 2.—*Comparison of average numbers of livestock, income per head of cattle, and carrying capacity, in three irrigation areas.*

	Western Transvaal. (2A.)	Sour Highveld. (2B.)	Eastern Transvaal. (2C.)
Cattle	35	77	72
Sheep	20	107	80
Horses, mules and donkeys	4	7	6
Pigs	3	4	5
Poultry	66	80	101
Income per head of owner's cattle	£0·45	£0·38	£0·53
(i) Carrying capacity l.s.u. per 100 morgen	17·9	16·6	16·4

N.B.—l.s.u. stands for large stock units: 1 head of cattle or horse = 7 sheep = 4 pigs = 100 head of poultry.


KAART VAN DIE HOOF-LANDBOUSTREKE
VAN DIE OOSTELIKE DEEL VAN DIE
UNIE VAN SUID-AFRIKA
MAP OF THE MAIN AGRICULTURAL REGIONS
OF THE EASTERN PART OF THE
UNION OF SOUTH AFRICA
Bygevoeg - Graanstreke Van Westelike Kaap (Selfde Skaal)
Inset - Cereal Regions Of Western Cape (Same Scale)
Zeerust
Pretoria
Middelburg
Lichtenburg
Johannesburg
Bethal
Potchefstroom
Vereeniging
Ermelo
Swaziland
Lourenco Marques
Piet Retief
Vryburg
Kroonstad
Reitz
Hoopstad
Vryheid
Dundee
Hlabisa
Harrismith
Senekal
St. Lucia
Bergville
Ficksburg
Eshowe
Bloemfontein
Basutuland
Pietermaritzburg
Underberg
Durban
Kokstad
Barkly Oos
Molteno
Middelburg
Umtata
Port St Johns
Queenstown
Fort Beaufort
East London
Bathurst
Alexandria
Port Elizabeth
Piquetberg
Darling
Malmesbury
Worcester
Cape Town
Swellendam
Caledon
Riversdal

On the smaller irrigation farms such as are found on government settlements, lack of pasture makes stock-farming about impossible. On the larger farms, however, stock farming, which here consists mainly of cattle farming, plays an important rôle. The average figures for stock farming in the three areas are reflected in Table 2.

Stock Farming.

The poor quality of the pasturage, especially during winter, is reflected in the low carrying capacity of 16 to 18 large stock units per 100 morgen or approximately 6 morgen per head of cattle.

Cattle.—As will be seen, cattle farming is the most important branch of stock farming, but even here the income derived from cattle is small in comparison with that earned on the inland plateau. Contributory causes are poor pasturage, poisonous plants and,especially, the sub-tropical diseases such as heartwater, which result in stock losses and hamper the improvement of cattle farming because of the severe mortality among high-producing cattle introduced from elsewhere. As a rule, therefore, scrub cattle predominate in this area, except on those dairy farms supplying the cities with milk. The percentage of cows which calve is also low, as mortality among calves sometimes is very high, especially where they are not inoculated against such diseases as black quarter. Some farmers neglect the regular dipping of their stock, and many do not realize the importance of feeding bonemeal for building bone and preventing "stiff sickness" and "lamsiekte" in those areas in which the grazing is deficient in phosphates.

The largest and best managed farms, which also yield the highest income per head, are found in the dryland area of the *Western Transvaal Area* (2 A). Many of these farms are situated in the semi-bushveld areas where the best cattle-veld of this area lies. In the *Eastern Transvaal* Area (2 C) cattle-farming is most successful in the "Rooimoot" as regard health and profitability; worst, in this respect, is the Lydenburg bushveld. A noteworthy feature in the latter area is the large number of native cattle on European farms, viz., two head of native cattle to every three animals belonging to the owner of the farm.

Sheep.—The long and coarse grasses, poisonous plants, diseases and hot climate all contribute to make this area largely unsuitable for sheep. The bastard sheep or "native sheep" found in these parts, are, however, fairly well adapted to these conditions. In the *Sour Highveld* (2 B), the young grass sprouting on burnt veld provides good pasture for small stock during spring. Large flocks of woolled sheep graze here during spring and are then moved to the *Highveld Cropping Area* (1 A), during November-December.

In the *Eastern Transvaal Irrigation Area* (2 C), the "Rooimoot", and the Crocodile and Dorp rivers sub-areas, on the other hand, provide winter pasturage, while the surrounding mountains provide grazing during summer.

In the *Sour Highveld* (2 B), where the largest number of sheep per farm is found, viz., 107, 42 per cent. of the flocks consist of bastard sheep while 13 per cent. belong to natives. The average weight of wool per sheep is 6·3 lb. and the average income 2/7, taking into consideration all sheep belonging to farm owners.

Other Stock.—Mainly owing to the prevalence of horsesickness very few horses are found in this area. Donkeys are numerous, however, and are used to a fair extent for heavy draught purposes.

Pigs are generally kept on a small scale. Except in the neigh-

TABLE III.—*Sources of cash income. Average per farm according to sub-areas—Transvaal Irrigation Area.*

	WESTERN TRANSVAAL IRRIGATION AREA.					EASTERN TRANSVAAL IRRIGATION AREA.				Sour Highveld.
	Private Irrigation.	Citrus Farms.	Government Settlers.	Dryland.	Average for Area.	Rooimoot.	Crocodile and Dorps River.	Lydenburg Bushveld.	Average per Area.	
No. of cases	222	29	49	26	326	33	34	56	123	78
	£	£	£	£	£	£	£	£	£	£
Crops.										
Wheat	49·6	31·8	70·9	1·2	47·4	85·2	74·2	290·8	174·2	22·6
Maize	11·0	3·3	1·7	59·5	12 8	23·8	34·3	17·8	24·0	30·3
Tobacco	85·3	60·6	92·5	9·9	78·2	—	—	—	—	—
Fruit	6·7	196·3	0·1	—	22·0	—	—	—	—	—
Potatoes	6·9	—	0·4	—	4·8	1·7	0·8	—	0·7	3·9
Beans	—	—	—	—	—	—	6·6	11·9	7·2	1·4
Vegetables	17·2	1·0	0·6	—	11·9	3·6	15·7	12·0	11·1	4·8
Oats	—	—	—	—	—	—	12·3	3·1	4·8	—
Brewer's barley	—	—	—	—	—	—	—	34·8	15·9	—
Cotton	—	—	—	—	—	—	—	14·7	6·7	—
Other	12·4	7·8	5·0	3·9	10·1	8·0*	7·9*	25·1*	15·7*	0·8
TOTAL CROPS	189·1	300·8	171·2	74·5	187·2	122·3	151·8	410·2	260·3	63·8
Stock.										
Cattle	10·5	7·2	2·4	42·2	11·5	42·5	25·9	14·3	25·1	22·9
Sheep	0·9	—	—	—	0·6	16·3	6·4	0·6	5·5	12·3
Horses	—	—	—	—	—	0·3	0·5	—	0·2	—
Pigs	0·1	—	—	—	0·1	3·5	1·0	2·6	2·4	1·1
Poultry	15·6	2·4	1·2	2·9	11·3	5·1	10·3	12·1	9·8	8·5
TOTAL STOCK	27·1	9·6	3·6	45·1	23·5	67·7	44·1	29·6	43·0	44·8
GRAND TOTAL	216·2	310·4	174·8	119·6	210·7	190·0	195·9	439·8	303·3	108·6

TABLE III (*continued*).

Percentage of Total.

	Western Transvaal Irrigation Area.					Eastern Transvaal Irrigation Area.				Sour Highveld.
	Private Irrigation.	Citrus Farms.	Government Settlers.	Dryland	Average for Area.	Rooimoot.	Crocodile and Dorps River.	Lydenburg Bushveld.	Average per Area.	
Crops.										
Wheat	22·9	10·3	40·5	1·0	22·5	44·8	37·9	66·1	57·5	20·8
Maize	5·1	1·1	1·0	49·7	6·1	12·5	17·5	4·0	7·9	27·0
Tobacco	39·4	19·5	52·9	8·3	37·1	—	—	—	—	—
Fruit	3·1	63·2	0·1	—	10·4	—	—	—	—	—
Potatoes	3·2	—	0·2	—	2·3	0·9	0·4	—	0·2	3·6
Beans	—	—	—	—	—	—	3·4	2·7	2·4	1·3
Vegetables	8·0	0·3	0·3	—	5·6	1·9	8·0	2·8	3·7	4·4
Oats	—	—	—	—	—	—	6·3	0·7	1·6	—
Brewer's barley	—	—	—	—	—	—	—	7·9	5·2	—
Cotton	—	—	—	—	—	—	—	3·3	2·2	—
Other	5·8	2·5	2·9	3·3	4·8	4·2	4·0	5·7	5·1	0·7
TOTAL CROPS	87·5	96·9	97·9	62·3	88·8	64·3	77·5	93·2	85·8	58·7
Stock.										
Cattle	4·8	2·3	1·4	35·3	5·5	22·4	13·2	3·3	8·3	21·2
Sheep	0·4	—	—	—	0·3	8·6	3·3	0·1	1·8	11·3
Horses	—	—	—	—	—	0·2	0·2	—	0·1	—
Pigs	0·1	—	—	—	—	1·8	0·5	0·6	0·8	1·6
Poultry	7·2	0·8	0·7	2·4	5·4	2·7	5·3	2·8	3·2	7·8
TOTAL STOCK	12·5	3·1	2·1	37·7	11·2	35·7	22·5	6·8	14·2	41·3
GRAND TOTAL	100·0	100·0	100·0	100·0	100·0	100·0	100·0	100·0	100·0	100·0

* Includes small income from fruit and tobacco.

bourhood of the cities, there are very few *poultry farms* in this area. On many of the smaller farms the cash income derived from poultry farming plays quite an important rôle in the household economy of the farmer.

Sources of Cash Income.

In Table 3 a comparison is made of the gross cash income per farm in the various sub-areas. It is noteworthy throughout the area that crop-farming produces a larger income than stock-farming. On the citrus and government settlement farms of the *Western Transvaal Area* (2 A), practically the entire income, viz., 96·9 per cent. and 97·9 per cent., is derived from trees and crops respectively.

The widely different conditions existing within an area are clearly reflected in the various sources of income. Income derived from fruit takes first place in citrus farming, followed by wheat and tobacco. In the case of the private irrigation farmers and government settlers of the *Western Transvaal Irrigation Area* (2 A), on the other hand, tobacco is the most important source of income, followed by wheat. The income per morgen of tobacco is very low, however, being less than £20 per morgen on 41 per cent. of the tobacco producing farms.

On the dryland farms of the latter area and in the *Sour Highveld* maize heads the income groups, while wheat come first throughout the Eastern Transvaal Area. The Lydenburg bushveld is the only sub-area showing any income from brewer's barley and cotton. The vegetables of the Eastern Transvaal Area are produced mainly for the winter market. Other crops such as lucerne, sweet potatoes, vegetables and flowers, all contribute largely to the income of some farms, but are not of great importance in the area as a whole.

The income derived from poultry exceeds that derived from cattle in the private irrigation-farming group of the *Western Transvaal* (2 A), whereas cattle contribute a considerable portion of the total income in the case of the dryland farms. Sheep provide practically no income in the *Western Transvaal Area* (2 A).

It is taken into consideration that costs are high in the case of crop-farming, especially with intense cultivation such as is required in the case of crops like citrus, tobacco and vegetables. It becomes clear that the net income derived from these types of farming is not high, except, perhaps, in the Lydenburg bushveld. Consequently, cattle farms are found scattered throughout the entire area, especially in the *Sour Highveld* (2 A). Some of these farms were either cut up into too small portions, or did not have enough good tillable soil; on others again, irrigation farming was tried out with an uncertain or inadequate water supply. The result was that the incomes derived from these farms are so low that the occupants are forced to adopt a very low standard of living.

Burden of Debt.

Government settlers are burdened with an average debt of £135 per £100 fixed capital. The debt position of this group can hardly be compared with that of the private farmers since the settlers in many cases received their total farming capital (capital for buying the farm, for improvements, equipment and draught animals) from the government on credit on reasonable terms of payment. Moreover, the valuation of settlement-land is not based on market prices so that it is, as a rule, much lower than that of privately owned farms. This makes for an unfavourable comparison of debt with fixed capital.

The citrus farms have the smallest burden of debt, calculated in terms of fixed capital, viz., £12·3 for £100 fixed capital. In the other sub-areas the burden of debt per £100 fixed capital is as follows:—

Private irrigation farms: £22·5; dryland farms: £33·8; "Rooimoot": £25·2; Crocodile and Dorps rivers area: £21·7; Lydenburg bushveld: £13·4; Sour Highveld: £24·4.

General.

Probably one of the greatest problems in the entire irrigation area is the tendency to subdivide farms into uneconomic units. This happens on farms over which there is no control such as exists in the case of the Government settlements. Even on the old settlements, such as the one at Lagersdrift; the plots are too small, and on the Mapochsgronden there are dryland plots the size of which cannot be justified. It is, in the first instance, the pernicious tradition of the older generation of farmers to divide their farms equally amongst the heirs, which has led to great poverty and retrogression in many places. The division is usually such that each heir gets a share of the little piece of irrigated land. In such cases the grazing portion usually remains undivided and is so large that fencing is uneconomical. The result is a communal system of grazing which precludes sound pasture management. In some cases this subdivision has gone so far that heirs inherit portions smaller than one morgen as their share of the irrigation land. In such cases an entire community may eke out a miserable existance under conditions which encourage evils such as undernourishment and intermarriage, which, in turn, may result in permanent physical and mental retrogression. Although existing legislation* provides for the expropriation of such unprofitably occupied farms and although a start has already been made in carrying this legislation into effect, the problem is still unsolved and the main cause of it, viz., the system of inheritance, not yet removed.

(**The Unbeneficial Occupation of farms Act (No.* 29 *of* 1937) *and the Amendment Act No.* 35 *of* 1939. *Farms have already been expropriated under this act, amongst others, farms in the districts of Rustenburg, Brits, Pretoria, and Middelburg which fall in this irrigation area.*

(N.B.—To be continued in subsequent issues).

Nursery Quarantines.

The following nursery quarantines were in force on 1 May 1942:—

(1) Alkmaar Estates, Alkmaar, on Citrus (all), for red scale.

(2) Kildare Nurseries, Pietermaritzburg, on apples (part), for pernicious and white peach scales.

(3) Subkleve's Nurseries, Johannesburg, on deciduous fruit trees (part), for pernicious scale.

(4) Page's Nurseries, Fransch Hoek, on citrus (all), for red scale.

(5) F. P. Long, Clumber, on citrus (whole), for red scale.

(6) E. O. Hiscock, Clumber, on citrus (whole), for red scale.

(7) James Clark, Pretoria, on mixed deciduous, flowering deciduous and oak trees, for pernicious and oak scales.

Factors Affecting Profitability in Poultry-Farming.

P. H. C. du Plessis, Assistant Professional Officer (Poultry), College of Agriculture, Glen.

DURING the past two years the number of poultry-farming undertakings has considerably increased. Present conditions and the smaller capital outlay required, as compared with other branches of farming, may perhaps account for this tendency. The very nature of the enterprise makes it popular and attractive. Poultry-farming can be carried on in conjunction with almost any type of farming or profession and provides an opportunity for leading a very active, healthy outdoor life. The fact that it does not entail strenuous manual labour makes it an enterprise in which all the members of the family may participate.

In the past very few people turned to poultry-farming as their sole means of earning a livelihood. The enterprise was carried on more for own consumption and as a hobby. To-day, however, the importance of poultry-farming is realized and farmers are conscious of the fact that it is capable of yielding good financial results and constitutes one of the most productive branches of farming.

Although one learns best by experience, it is nevertheless desirable to enumerate for the benefit of the beginner a few of the most important economic factors on which the success of poultry-farming depends. Coupled with experience there is the personal factor, which plays an equally important rôle. The poultry-farmer must have enthusiasm for the work itself, and the financial results obtained by others should not be the only consideration inducing him to engage in this type of farming. The success of the undertaking is determined more by the ability of the farmer to make practical use of his knowledge than by his actual knowledge itself. It is essential for success that the poultry-farmer should be observant and precise in his methods.

Capital Outlay.

Capital and its distribution are undoubtedly the factors demanding most attention since they determine the payability of poultry-farming. Capital should be judiciously invested and spread over the entire undertaking. The capital value represented by each bird in the flock is very low, and the risk of overcapitalization is therefore very easily incurred.

The two most important items on which capital is expended are the purchase of birds and the construction of houses, which account for 35 per cent. and 50 per cent. of total capital investment respectively. The amount invested in land is insignificant unless the ground is situated in the vicinity of a large city or in an area where land values are particularly high. The capital investment amounts to approximately 15s. to 20s. per hen. Costs in excess of this figure, immediately involve the risk of overcapitalization. The total turnover per annum and the quality of the birds are two important factors in determining the amount of capital investment.

Since capital investment in housing is the most important item, this outlay should be kept at the lowest level consistent with efficiency. Most of the materials required are available on the farm and by employing local labour, cheap, efficient and lasting houses may be constructed. Needless investment should be avoided since this will affect the net profit.

Average Production per Hen.

The average production per hen is a very important factor in determining the profitability of the enterprise. If the average egg-production of the flock reaches or exceeds the 150 mark, an average gain of 6s. per hen may be expected. An increase in production will considerably lower the cost per doz. eggs. An increase in production brings about a corresponding decrease, at double the rate, in the cost of producing a dozen eggs. An average production of 20 to 25 per cent. covers only feeding costs. Poultry-farming is remunerative if the gross income from eggs amounts to double the cost of the feed. The average hen requires from 5 to 7 lb. of feed for producing 1 doz. eggs. Under normal conditions about 4½ doz. eggs will be required for paying the feed of one hen. As production increases, the maintenance, feed and labour costs decrease.

Since feed represents the heaviest item of expenditure in egg-production, it deserves serious attention. In normal circumstances feeding costs amount to 60 per cent. of the total costs. For this reason it is imperative that the farmer should make the best use of those feeds which he produces himself. The best results are not always obtained with expensive rations or the greatest variety of feed ingredients. The feeding of an economical well-balanced ration should be the policy.

The importance of a high average production is therefore apparent, and those factors which influence productivity justify careful analysis. They may be summarized as follows:—

(*a*) *Heredity*.—The ability to produce a large number of eggs is hereditary; unless a hen possesses this quality, feeding and treatment will not lead to high production.

(*b*) *Feeding*.—The ideal ration is one containing all the desirable ingredients in the right proportion.

(*c*) *Care and treatment*.—Full protection should be provided against variable factors such as heat and cold.

(*d*) *Constitution and the elimination of poor layers*.— Only hens which have a good constitution and are able to stand a long period of production should be kept. Classing and the elimination of non-producers should be continuous.

(*e*) *The percentage of pullets in the flock*.—During the first year of production the egg yield is at its highest, i.e., the higher the percentage of pullets the higher the average production. The number of pullets in the flock is naturally determined by such factors as hatching, rearing, expenditure, and the quality of the second-year hens.

(*f*) *Percentage mortality*.—If the rate of mortality exceeds 10 per cent. to 15 per cent., it must be regarded as an indication of poor constitution and lack of resistance to disease. If the average production during the months of egg-scarcity is maintained at a level not

lower than 25 per cent. the poultry-farmer may rest assured that his enterprise will yield good profits. External and internal parasites should be controlled.

Hatching and Rearing Costs.

This is a very important factor, which undoubtedly influences the profitability of the enterprise and which requires constant review. The hatching of numerous chicks presents no difficulties; the rearing of such numbers in such a manner that they develop into profitable producers and breeders, however, is a different matter.

The most important cost items in connection with the hatching of eggs are the value of the eggs and the use of the equipment. Since the value of the eggs is the chief item, it is evident that a high percentage of chicks is essential, 60 per cent. of the total number of eggs being generally regarded as reasonable. The hatching results should never be lower than 90 per cent. From every six eggs placed in the incubator at least one pullet should be reared. If only small numbers of chicks are required, it is uneconomical for a farmer to use an incubator. He should preferably purchase day-old chicks and not invest money in incubators which cannot be utilized effectively.

The percentage of chicks reared is usually important. The incubation of the chick costs approximately 6d. and the cost of rearing a pullet up to the age 6 months amounts to approximately 4s. 6d. The most important cost items are naturally feed and labour, which amount to approximately 80 per cent. of the total costs. A mortality figure in excess of 20 per cent. is regarded as very serious and will entail a considerable increase in rearing costs. Furthermore, a high mortality figure is an indication that even those chicks which are successfully reared cannot become profitable producers since their growth and development have been retarded during some period of their life.

Labour.

The effective use of labour is absolutely essential since labour constitutes, next to feed, the most important cost item. It accounts for approximately 10 per cent. of the total expenditure. For this reason it is important that the farming operations should be arranged as conveniently as possible in order to obtain maximum service in minimum time.

The lay-out and management of poultry-farming are two important factors determining the effectiveness of labour utilization. The pens, houses and other structures should be so arranged in such a way as to eliminate unnecessary waste of time. The farm equipment should, as far as possible, be modern and convenient. The saving of labour effected by laying on water, for example, will always justify the expenditure.

Size of the Undertaking.

The economical payability of poultry-farming is undoubtedly also determined by its size. The greater the undertaking, the more effective the equipment, labour, and invested capital. The larger the number of birds, the lower the cost of feeding and also the cost per dozen eggs produced since purchases are then made on a wholesale basis.

It is generally presumed that on a commercial basis the best financial results are obtained from approximately 1,500 laying hens. It must, however, be well understood that this does not mean that good profits cannot be obtained from 300 to 400 hens. The increase in the number of birds only increases the payability since labour, capital, etc., are better and more effectively utilized.

Summary.

In order to obtain the best financial results, the poultry-farmer should keep the following facts in mind; and if he wishes to operate on a purely commercial basis, he must give effect to these hints:—

1. The number of hens must be 1,500 or more.
2. The annual egg production must be 18,000 dozen.
3. When eggs are produced exclusively for the market, the net profit per hen should be about 6s. per annum. The sale of day-old chicks and pullets will increase the profit per hen.
4. Care should be taken that the capital outlay never exceeds 15s. to 20s. per hen.
5. The average production per hen should be approximately 12 dozen eggs per annum.
6. During the months of egg-scarcity and the resultant higher prices, the production should never be lower than 25 per cent.
7. The value of eggs produced should cover at least twice the feeding costs. Otherwise there will be risk of operating at a loss.
8. The mortality figure should never exceed 10 to 15 per cent.
9. At least 90 per cent. of the eggs should be fertile, and at least 60 per cent. of the fertile eggs hatchable.
10. At least 80 per cent. of the chicks hatched should be reared.
11. A poultry-farming enterprise is payable if the total income obtained within a period of 2 years is equal to the capital invested.

Variability of the Maize By-Products.—

[*Continued from page* 368.

the door open for practically part of the maize plant to be put on the market under these commercial names.

Even in the case of maize meal a maximum fibre content is not laid down. Consequently there is nothing to prevent any person from adding maize bran to a true maize meal or even extracting some germ from it. The maize-meal sample taken from a large consignment of cattle feed and mentioned in the tables above, shows such a suspiciously high fibre and fat content and a correspondingly low content of nitrogen-free extracts that even our maize meals must be viewed with suspicion.

It would be far more satisfactory if these maize by-products were defined under the feed-law regulations and standards were laid down for protein, fat and fibre content. With strict control, the stock feeder would be able to buy and use these feeds to far better advantage. In the meantime the farmer will have to study the analysis of the feed offered and take special notice of the protein and fibre content. By law the buyer has the right to demand an analysis of maize by-products if he buys more than 100 lb. at a time of such a feed.

Tetrachlorethylene-Liquid Paraffin Mixture ("Tetrol").

ON account of the difficulty of obtaining suitable tins for Tetram emulsion, the Division of Veterinary Services issues temporarily a mixture of Tetrachlorethylene and Liquid Paraffin, which can be used for the same purpose and in the same way as Tetram. It is *mainly intended as a remedy against hookworms in sheep,* but may also be used against other parasites as described below.

For Sheep and Goats.

The remedy kills hookworm, wireworm and bankrupt worm, and probably also the brown stomach worm.

The sheep must not be kept from food or water before or after treatment. Lambs should get no milk from 4 hours before until 2 hours after treatment. *The animals must be treated when it is cool and must be kept out of the sun for a while after treatment. The best time to treat is late in the afternoon when it is cool. Before, during and after treatment, the sheep must not be chased about.*

As in the case of the nodular worm remedy, each sheep must first get 2½ c.c. 10 per cent. bluestone solution. Immediately after which the remedy must be given. The spoon (marked X) of nodular worm remedy can be used to administer the bluestone solution. (To make 10 per cent. bluestone solution, dissolve 1 lb. bluestone in 1 gallon of water or 2 oz. bluestone in 1 pint of water.)

The mixture is clear, practically colourless, and is not diluted with water but is administered as it comes from the tin. Administer this mixture, immediately after the bluestone solution, by means of a suitable syringe:

to lambs of 3 to 6 months old, 7½ c.c.
to lambs of over 6 to 12 months old, 12 c.c.
to sheep over 12 months old, 15 c.c.

Weak animals should get smaller doses than those mentioned.

The mixture may cause animals to cough when they are dosed and to get giddy more than Tetram does; to avoid this, one or more parts of old motor oil may be added and the dose increased accordingly.

The remedy must be administered slowly into the side of the mouth.

The treatment has to be repeated twice with intervals of 10 to 14 days in order to clean the sheep of hookworms. If the sheep continue to run on infested ground ,more treatments will be required.

In order to exterminate hookworms, it is best to clean the sheep during the dry season.

Pregnant ewes should not be treated for about a month before lambing.

First make a test on a small number of sheep in order to see if there are no local conditions which might cause adverse effects.

The mixture is suitable for treatment of nasal worm in sheep, and detailed instructions can be obtained from the Division. In general, it is recommended, however, to clean the sheep of other worms first, since a small number of nasal worms is not very harmful.

For this purpose, the emulsion is diluted with an equal part of oil, and the dose of the diluted remedy is 5 c.c. on either side for sheep of all ages.

For Cattle.

The remedy is recommended against hookworms in cattle and it also kills wireworm and bankrupt worm.

General instructions as for sheep.

Cattle get, instead of bluestone solution, about half a cupful of 5 per cent. sodium bicarbonate (baking soda) solution ($\frac{1}{2}$ lb. baking soda to 1 gallon of water) and immediately thereafter the remedy, 15 c.c. for each 80 lb. live weight, but not more than 60 c.c. altogether.

Dosing Syringe.

The Division sells a suitable syringe for the administration of this remedy. The syringe holds up to 60 c.c.

Price List.

Tetrol, 1 gallon (4,500 c.c.) enough for about 300 adult sheep (one dosing, or for 900 sheep for nasal worm) 10s.; dosing syringe, 13s. 6d.; dosing syringe nozzle, 2s.; dosing syringe trocar and canula for nasal worm treatment, 3s. 6d. Syringe complete for 19s.

The remedy can be kept for an indefinite period. Tins which have been opened can be used again if kept well closed.

Points to Remember.

Vaccines, etc., may be obtained on application to any District Government Veterinary Officer or Resident Magistrate, or direct from the Director of Veterinary Services, P.O. Onderstepoort (telegraphic address: "Microbe, Onderstepoort"); the officer in Charge, Veterinary Research Laboratory, P.O. Box 405, Pietermaritzburg (telegraphic address: "Bacteria, Pietermaritzburg"); or the Officer in Charge, Veterinary Research Laboratory, P.O. Box 41, Grahamstown (telegraphic address: "Institute, Grahamstown").

Laboratory products are issued only on pre-payment or C.O.D. per post or rail, but it will be to the advantage of applicants to remit cash with order, as otherwise, in addition to the cost of the articles, they must also pay the C.O.D. charges, which, if sent per post, may run into quite an appreciable amount, as the minimum is 1s. per parcel. Cheques, etc., must be made payable to the Director of Veterinary Services.

Tetrol can be sent by rail only.

When replying to a letter or telegram always refer thereto by quoting the number and date thereof.

Ask for a price list of laboratory products and note the correct addresses.

Although the utmost care is taken in the preparation of this remedy, no guarantee is given regarding its safety or efficacy, nor will any compensation be paid for any deaths or accidents which may follow its use.

(Director of Veterinary Services.)

The Fat Content of Cheese Milk.

G. D. le Roux, Lecturer in Dairying, College of Agriculture, Cedara.

IT sometimes happens that cheesemakers complain about the excessive fat content of milk delivered to factories. Some factories which pay for cheese milk according to its fat content, even go so far as to stipulate a maximum fat content, with the result that the farmer receives no consideration for any fat in excess of the maximum percentage laid down, which in reality amounts to a reduced price for such rich milk.

Cheesemakers maintain that a large proportion of the fat in this rich milk is lost in the process of caseation, and it cannot be expected that the factory should bear this loss. Admittedly, this argument is partly true in theory, although it is probable that very few factories would be able to support their argument with figures.

Ratio between Fat and Casein.

The quantity of fat that can be coagulated by curd depends on the casein percentage of the emilk and also on the coagulability of such casein. In other words, the ratio between fat and casein is the decisive factor. As the ratio grows closer the curd would be able to bind more fat and it would therefore be possible to casefy richer milk with smaller loss.

Since both the fat and the casein content of milk should primarily be regarded as breed characteristics, the ratio between these two constituents will be determined mainly by the choice of a particular cattle breed, as well as by breeding and selection. According to Van Slyke and Price the weight ratios between the fat and casein content in the milk of various dairy breed are as follows:—

Friesland	100:67
Ayrshire	100:55
Shorthorn	100:65
Guernsy	100:54
Jersey	100:52

From these figures it appears that the milk of Friesland cows contains the highest number of parts by weight of casein per unit of fat. The milk of Frieslands will, therefore, undoubtedly bind the fat more completely in the process of caseation than the milk of e.g. Jersey or Guernsy cows. An increase in the fat content of Friesland milk results in a slight widening of the ratio between fat and casein, since the casein content usually does not increase in the same ratio as the fat content, but the breed characteristics nevertheless remain dominant. Consequently in the preparation of cheese, Friesland milk which is rich in fat will always retain its advantage over Jersey milk with the same fat content. Another characteristic of Friesland milk as well as of Ayrshire milk which makes it pre-eminently suitable for cheesemaking is the small division of the fat particles present in the milk. For this reason the fat in Friesland milk is less easily separated than that in the milk of other breeds which equally produce milk with a high fat content, and therefore the losses during the process of preparation will also be smaller. Although the milk of Friesland and Ayrshire cows contains an unusually high percentage of fat, it should therefore be considered as pre-eminently suitable for cheesemaking.

Coagulability of Casein.

The ability of casein to bind the fat in milk in the process of caseation is also greatly influenced by the coagulabilty of casein, a function which is to a large xetent dependent on the presence of certain mineral substances in milk. The quantity of these substances present in milk is determined within certain limits by their concentration in the feeds eaten as well as by the ability of the cow to render them available for milk production.

From the foregoing it is evident that breeding and selection coupled with a suitable milk-recording scheme, should be adapted to the commercial projects of the dairy farmer, just as an instrument chosen for a contemplated job should be suited to its purpose.

It is felt that the valuable fat should not be lost unnecessarily, and that the richness in fat of milk intended for cheesemaking should be regulated by the choice of the correct cattle breed, as well as by breeding and selection, and to a lesser extent by daily management methods. Any change in the fat content of milk delivered will, however, be a long-term process.

Maintenance of Soil Erosion Dams.—

[*Continued from page* 378.

Suitable Plants.

All plant growth established as a result of the dam should be suited to the climate and local conditions, and should provide the maximum protection to the soil by its roots, blades and foliage and further should be such that it can be utilized with circumspection for purposes of stock feed. In such reclamation work the dam embankment is the key position, and with its exploitation to the fullest extent the resultant benefits can be extremely effective. The dam retains moisture in the neighbourhood and improves the underground water supplies locally or farther afield; consequently, with another two dams in the same sloot the collective benefit will be more than trebled.

Stock should be excluded from the reclamation area until the plant population is fit to withstand *judicious* grazing. The area concerned should be fenced, and where expense makes it impossible to fence all the sloots on the farm, one area at a time should be enclosed until success has been achieved, and the fence then removed and erected around the second area.

Swill as Pig Feed.—

[*Continued from page* 374.

There are some farmers who are already making use of the swill of military camps, restaurants and large hotels, but most of the swill originating from private households is wasted. To avoid this loss, organizations should be formed in the same way as has already been done abroad, which will collect all the kitchen waste for the farmers. The co-operation of the townspeople to eliminate the waste of valuable feed should not be difficult to obtain.

Crops and Markets

A Statistical and Economic Review of South African Agriculture

by

The Division of Economics and Markets

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CONTENTS

* Price Review for April, 1942.

SLAUGHTER CATTLE.—Larger supplies of cattle consisting mainly of medium and compound classes came on the market during the month. The demand for prime classes was very strong, and during April prices for ordnary primes on the Johannesburg market rose by 2s. to 49s. 10d. per 100 lb. estimated dress weight *on the hoof*. Good mediums remained unchanged while compounds showed a further decline from 36s. 11d. in March to 35s. 6d. in April. On the Durban market prices showed little change and medium cattle averaged 37s. 3d. per 100 lb. dressed weight *on the hoof* and compounds 28s. 5d.

Slaughter Sheep.—Fairly bigger supplies of sheep on the Johannesburg market caused prices for all classes to fall, e.g., prime merinos from 9·6d. per lb. estimated dressed weight *on the hoof* in March to 8·8d. in April, and medium merinos from 8·4d. to 7·7d. On the Cape Town market prices remained practically unchanged. Prime merinos were 9·7d. per lb. and medium merinos 8·8d. per lb.

Pig prices showed no change.

Feeding Stuffs.—Supplies of feeding stuffs were moderate and good quality very scarce. Prices rose further, e.g., on the Johannesburg market Cape lucerne advanced from 5s. 4d. per 100 lb. in March to 5s. 8d. in April; Transvaal lucerne from 4s. 11d. to 5s. 6d., and teff hay from 5s. 6d. to 6s. 4d.

Potatoes.—Transvaal and, to a lesser extent, Orange Free State potatoes were predominant on most markets. Offerings were generally higher than during the previous month. Although nearly everywhere prices declined somewhat, the demand, however, was strong and especially in the coastal towns the presence of convoys had as a result that the big supplies did not have a very depressing effect on prices. Transvaal No. 1 on Johannesburg market declined from 16s. 6d. per bag in March to 14s. 6d. in April, and No. 2 from 15s. 2d.

*All prices mentioned in this article are average prices.

to 13s. 4d. National Mark grades showed little change compared with the previous month. On the Cape Town market Cape No. 1 even advanced, viz., from 18s. 4d. to 19s. 9d., while on the Durban market Natal No. 1 declined from 21s. 3d. to 18s. 2d.

Onions.—The supply of Cape Onions was heavy on most markets as the season is now in full swing. Prices were, on the whole, higher than during the previous month on account of better quality. Cape onions on the Johannesburg market were 12s. 10d. per bag in April as against 9s. 5d. in March, and on the Cape Town market 7s. 6d. in April as against 6s. 7d. in March.

Vegetables.—There were larger supplies of pumpkins and cabbages on almost all markets, while supplies of cauliflower also increased towards the end of the month. Ohter vegetables were scarcer and in many cases insufficient for the demand. Low veld vegetables started to arrive on the Johannesburg and Pretoria markets, although not yet in large quantities.

Tomatoes.—Low veld tomatoes were fairly abundant on the Johannesburg and Pretoria, Durban and Pietermaritzburg markets, while locally produced tomatoes predominated on other markets. Prices declined generally, and considerably on some markets except on the Cape Town market where the price of trays rose from 1s. 3d in March to 1s. 8d. in April.

Fruit.—Apples and grapes were still the most important deciduous fruits offered on the market, although the latter deminished considerably towards the end of the month. Moderate quantities of pears were also offered.

Large quantities of oranges, especially navels from the Transvaal, arrived on all markets. Many were of inferior quality and still green, with the result that prices declined sharply. The price of navels on the Johannesburg market fell from 3s. 7d. per pocket in March to 2s. in April, on the Cape Town market from 6d. 6d. to 2s. 4d. and on the Durban mraket from 4s. 3d. to 3s. 4d. per pocket.

With the exception of avocados, the supply of other tropical truits was generally moderate to scarce.

Eggs.—Eggs were still scarce and prices avanced further, e.g., the price of new laid eggs on the Johannesburg market advanced from 2s. per dozen in March to 2s. 3d. in April, and on the Durban market from 2s. 6d. to 2s. 10d. per dozen.

Index of Prices of Field Crops and Animal Products.

The index for prices of hay again rose during April and was 151 as against 140 the previous month, due mainly to a rise in the price of lucerne. A further advance in the price of eggs was also the main cause for the rise in the index of prices of poultry and poultry products, viz., from 168 in March to 175 in April. The most important declines occurred in the index of prices of slaughter stock, viz., from 134 to 129, as a result of a fairly sharp drop in sheep prices on the Johannesburg market, and to a lesser extent by the slight drop in cattle prices and in the index of "other field crops", i.e., for potatoes, onions, sweet potatoes and dried beans, viz., from 175 to 170, which was caused mainly by a drop in the prices of potatoes.

The remaining groups showed little or no change, and the combined index also remained unchanged at 125.

(See table elsewhere in this issue.)

Index of Prices Paid for Farming Requisites.

FUEL.—The index of prices of this rose from 125 in January to 134 in April, caused by a rise in the price of petrol. Fuel and crude oil, power paraffin, lubricating oil and grease remained unchanged in price.

Bags.—This index rose from 188 in January to 194 in April. Woolpacks were 4s. 4d. each, free-on-rail at the coast in January, and 4s. 6d. in April, while 2½ lb. grain bags were 11s. 6d. each in January and 1s. in April.

Feeding stuffs.—This index rose from 115 in January to 125 in April. An advance in the price of nearly all kinds of feeding stuffs, especially of hay and oats, was responsible for this.

The indexes of prices of farm impliments and spare parts, fertilizers, fencing materials, dipping and spraying materials and of building materials remained unchanged during April, compared with January 1942.

(See table elsewhere in this issue.)

The Marketing of the 1941/2 Maize Crop.

WITH the expected smaller maize crop for 1941/42 as a result of the drought during the past season, the Food Controller has considered it necessary to control the marketing of the whole crop as from 1 May 1942 in order to assure the supply of maize for the most essential national needs.

For this purpose the Mealie Industry Control Board willingly places the machinery of the Board at the disposal of the Food Controller in order to administer the control hereof.

The Mealie Control Board will register all traders upon application, and only such registered traders may buy maize from producers at fixed prices, while maize co-operatives may also receive maize from members and non-members at the same fixed prices, viz.

For grades 2, 4 and 6, the price of 15s. per 200 lb. nett in bags; for grades 3, 5 and 7, 14s. 10d. per bag, and for grade 8 14s. 8d. per bag. For maize delivered in elevators the price reveived by the producer will in each case be 9d. per 200 lb. less than the corresponding price in bags. The above prices will be paid where delivery is effected according to agreement.

Consumers prices.—As announced in the Government Gazette Extraordinary of May 1942, consumers' prices until 31 August 1942, will be 15s. 7d. per bag (free-on-rail, senders' station) for grades 2, 4 and 6; 15s. 5d. for grades 3, 5 and 7, and 15s. 3d. for grade 8 where 100 bags or more are taken at a time. For quantities between 21 and 99 bags, between 20 and 6 bags, between 5 and 2 bags and lastly for a single bag, the price will be increased by 3d. per bag for each quantity group, so that in the last case, for instance of a single bag, the price will be 16s. 7d. per bag for grades 2, 4 and 6, and 16s. 5d. per bag for grades 3, 5 and 7. Railage is paid by the consumer.

The above prices include a levy of 3d. payable by traders to the Mealie Control Board in respect of each bag of maize delivered to them. After 31 August 1942 all prices indicated above will be increased by 1d. per bag per month.

Maize Products.—In the case of maize products, the following maximum prices have been fixed, and are *delivered* prices, free-on-rail, buyers' station.

Maize Product.	30 bags. and more.	29 to 11.	10 to 6.	5 to 2.	1 bag.
	s. d.	s. d.	s. d.	s. d.	s. d.
No. 1 Fine Granulated Mealie-meal......................	18 0	18 4	18 8	19 0	19 6
Unsifted granulated mealie-meal......................	17 6	17 10	18 2	18 6	19 0
Unsifted other than granulated Mealiemeel................	17 0	17 4	17 8	18 0	18 6
Sifted crushed mealies........	17 3	17 7	17 11	18 3	18 9
Unsifted crushed mealies.....	17 0	17 4	17 8	18 0	18 6
Samp........................	23 6	23 10	24 2	24 6	25 0
Mealie rice...................	23 6	23 10	24 2	24 6	25 0
Mealie germ meal...........	11 6	11 10	12 2	12 6	13 0
Hominy chop..............	10 0	10 4	10 8	11 0	11 6

There are no restrictions on the sale of those products which serve exclusively as human food, such as No. 1 fine granulated mealie meal, unsifted granulated meal, samp and mealie rice at the fixed maximum prices. For those products which can also be used as animal feed, such as mealies in the grain, unsifted mealie meal other than granulated, sifted and unsifted crushed mealies, maize germ meal and hominy chop, consumers will, for the time being, receive only 2 bags per month, and *bona-fide* farmers up to 25 bags per month without a permit. For quantities above these a permit is necessary which may be obtained from the Mealie Control Board upon application.

All traders and larger consumers are advised to study carefully the proclamation issued in the Government Gazette Extraordinary of May 1942.

Butterfat and Cheese Milk: Prices and Production.

The prices of butterfat, delivered at creameries, were fixed by the Dairy Control Board, as from 1 February 1942, at 1s. 5d., 1s. 3d. and 1s. 1d. per lb. for 1st, 2nd and 3rd grade respectively. For the months of May and June 1942, the Board will now pay a subsidy of 3d. per lb. to producers for all butterfat delivered by them to creameries, and from 1 July 1942, until further notice, a subsidy of 5d. per lb. on all grades delivered. This means that producers will, e.g., receive 1s. 8d. per lb. for 1st grade butterfats as from 1 May and 1s. 10d. per lb. as from 1 July. The corresponding price for 1st grade butterfat the previous season was 1s. 2d. per lb. during May and June and 1s. 5d. per lb. from 1 July as a result of a subsidy of 3d. per lb. paid by the Board.

Prices of cheese milk delivered to cheese factories were fixed by the Board as from 1 February 1942, at 8½d. per gollon or 1s. 11½d. per lb. of butterfat contained therein. From 1 May until further notice, the Board will pay producers, through their factories, a subsidy of 1½d. per gallon of cheese milk or 4½d. per lb. of butterfat contained. This means that producers will receive 10d. per gallon for cheese milk from 1 May this year. The corresponding price during the winter months last year was 7d. in May and 8d. in June.

Wholesale and retail prices of butter and cheese remain unchanged, viz., 1s. 8d., 1s. 6d. and 1s. 4d. per lb. wholesale for 1st,

2nd and 3rd grade butter respectively, and 1s. 3d., 1s. 2d. and 1s. respectively for cheese, plus 2d. per lb. in the case of butter and 3d. per lb. in the case of cheese in the retail trade.

Production.—As a result of good rains, especially in the cheese milk producing areas like the Eastern Province, East Griqualand and Border districts, the production of factory cheese advanced appreciably during the past couple of months, while that of butter can now be regarded as normal. Factory cheese production in the Union for months January, February and March 1942 was 1,395,000 lb., 1,603.000 lb. and 1,827,000 lb. respectively as against 1,379,000 lb., 1,257,000 lb. and 1,327,000 lb. for the corresponding months of 1941. Production of creamery butter in the Union for these three months was 3,962,000 lb., 4,517,000 and 5,519,000 lb. respectively as against 5,854,000 lb., 5,942,000 lb. and 5,590,000 lb. for the corresponding months the previous year.

Sugar Production: 1941/42 Season.

According to the South African Sugar Association, 452,119 short tons of sugar were produced during the past season (1941/42) as against 572,860 tons during 1940/41 and 595,556 tons during 1939/40.

Review of 1940/41 Cotton Crop.

GENERAL climatic conditions during the growing season of the 1940/41 cotton crop were fairly good, and a satisfactory crop was produced. In contrast with previous years, when most of the crop was exported, the entire crop during the past season was taken up by South African industries. The demand was much bigger than the supply. Prospects for cotton producers therefore seems very good. Unfortunately the 1941/42 crop is poor as a result of the serious drought during the past summer.

As per ginners' returns, the total crop amounted to 742,902 lb. lint, or 1612 running bales. The details, compared with previous years, are as follows:—

	1940–41.	1939–40.	1938–39.	1937–38.	1936–37.
Running Bales..............	1,612	1,676	604	938	2,881
Statistical Bales (500 lb.)....	1,486	1,649	598	906	2,718
Lint (lb.)....................	742,902	824,514	298,853	452,790	1,359,060
Seed Cotton (lb.)............	2,125,199	2,529,819	894,691	1,436,411	4,300,264
Seed (delinted and undelinted (lb.)......................	1,307,052	1,601,898	550,334	904,455	2,682,536
Linters (lb.)..................	78.501	75,597	21,599	37,990	144,015

Production by areas, with the last two seasons' figures for comparison, is as follows:—

	1940–41.	1939–40.	1938–39.
Natal and Zululand.........................	497,379	772,989	533,588
Rustenburg area (including Pretoria and Marico dist.)...................................	194,180	147,351	18,101
Northern Transvaal (including Waterberg, Pietersburg and Zoutpansberg)............	182,650	203,591	—
Eastern Transvaal (including Middelburg, Lydenburg and Barberton)................	1,046,825	1,002,389	327,069
Southern Transvaal (Pongola River Area).....	1,451	—	—
Cape Province.............................	63,684	305,859	6,316
Swaziland..................................	139,030	97,640	9,617

GRADING.

Comparison of Staple.	1940–41.		1939–40.		1938–39.		1937–38.	
	Bales.	Per-sent.	Bales.	Per-sent.	Bales.	Per-sent.	Bales.	Per-sent.
1 inch and above...	—	—	153	9·13	4	·66	193	20·58
$1^3/_{16}$ inch............	61	3·78	53	3·16	—	—	63	6·72
Full $1\frac{1}{8}$ inch.........	—	—	—	—	—	—	7	·74
Good $1\frac{1}{8}$ inch.........	1,017	63·09	1,067	63·66	397	65·73	177	18·87
$1\frac{1}{8}$ inch..............	485	30·09	390	23·27	201	33·28	427	45·52
$1^1/_{16}$ inch and below.	49	3·04	13	·78	2	·33	71	7·57
TOTAL.........	1,612	100	1,676	100	604	100	938	100

Comparison of Grades of Good Colour Cotton.	1940–41.		1939–40.		1938–39.		1937–38.	
	Bales.	Per-sent.	Bales.	Per-sent.	Bales.	Per-sent.	Bales.	Per-sent.
"Middling Fair".....	—	—	—	—	—	—	98	10·45
"Strict Good Middling"	117	7·26	199	11·87	19	3·15	141	15·03
"Good Middling"....	281	17·43	193	11·52	19	3·15	78	8·31
"Strict Middling"...	281	17·43	436	26·01	50	8·28	136	14·50
"Middling".........	141	8·75	301	17·96	180	29·80	191	20·36
"Strict Low Middling"	213	13·21	212	12·65	58	9·60	42	4·48
Good colour..........	1,033	64·08	1,341	80·01	326	53·98	686	73·13
Fair colour..........	8	·50	105	6·27	10	1·66	4	·43
Very light spotted....	434	26·92	182	10·86	211	34·93	129	13·75
Other off-colour......	137	8·50	48	2·86	57	9·43	119	12·69
TOTAL.........	1,612	100	1,676	100	604	100	938	100

Price Tables.

Year and Month.	Implements. (a)	Fertilizers. (b)	Fuel. (c)	Bags. (d)	Feeding Stuffs. (e)	Fencing Material (f)	Dipping and Spraying Material. (g)	Building Material. (h)
Base—								
1936–38...	100	100	100	100	100	100	100	100
1939......	105	106	98	146	90	114	100	103
1940......	120	139	117	171	95	176	112	124
1940—								
January...	113	127	112	233	89	149	112	115
April......	122	131	112	181	93	166	112	122
July.......	123	139	113	155	96	182	112	127
October...	123	149	125	147	96	191	113	127
1941—								
January...	124	166	121	152	99	192	113	128
April......	125	166	125	174	109	198	114	136
July.......	125	173	125	182	114	210	117	151
October...	122	173	125	192	114	231	117	162
1942—								
January (j)	121	173	125	188	115	229	117	164
April......	122	173	134	194	125	228	117	164

The following is the composition of the above groups. (The items are weighted according to their respective importance) !—

(*a*) Ploughs, planters, seed drills, harrows, cultivators, ridgers, mowers, binders-hay rakes, silage cutters, hammer mills, separators, windmills, shares, land, sides, mouldboards, knife, pitman, guard.

(*b*) Superphosphate, ammonoium sulphate, potash, muriate, bonemeal.

(*c*) Petrol, power paraffin, crude oil, grease, lubricating oil.

(*d*) Woolpacks, grain bags, sail twine, binder twine.

(*e*) Mealies, bran, oats, lucerne, groundnut-oil cake, bonemeal, salt.

(*f*) Fencing wire, standards, baling wire.

(*g*) Bordeau mixture, lime sulphur, arsenate of lead, cyanogas, Cooper's sheep dip, Little's dip, Tixol cattle dip.

(*h*) Corrugated iron, deals, cement, lime, flooring boards.

(*j*) Preliminary.

Index of Prices of Field Crops and Animal Products.

(Basic period 1936-37 to 1938-39 = 100.)

SEASON (1st July to 30th June).	Summer Cereals, (*a*)	Winter Cereals. (*b*)	Hay. (*c*)	Other Field Crops. (*d*)	Pastoral Products. (*e*)	Dairy Products. (*f*)	Slaughter Stock. (*g*)	Poultry and Poultry Products. (*h*)	Combined Index.
WEIGHTS.	19	13	2	3	34	6	17	6	100
1936–37.........	118	86	94	93	122	86	89	98	106
1937–38.........	89	106	112	118	98	112	105	107	101
1938–39.........	92	107	96	89	79	102	106	94	93
1939–40.........	86	106	77	93	116	105	106	89	104
1940–41.........	109	113	106	159	103	108	110	112	109
1941–									
January.......	121	115	98	121	100	104	115	96	109
February......	122	115	92	115	100	104	112	107	109
March.........	135	115	87	125	100	104	105	125	112
April.........	126	116	98	167	101	106	108	151	114
May...........	112	116	125	160	101	109	108	157	112
June..........	110	116	126	183	101	111	111	150	113
July..........	112	118	128	241	100	130	118	145	117
August........	111	118	132	216	100	130	119	109	114
September.....	118	118	154	228	100	130	128	108	118
October.......	124	119	138	268	100	128	135	115	121
November.....	124	137	110	250	100	128	140	118	124
December......	127	137	135	199	100	122	147	128	125
1942—									
Jan...........	131	137	126	180	100	122	144	141	125
Feb...........	132	138	125	168	101	130	140	147	125
March.........	126	140	140	175	101	130	134	168	125
April..........	126	139	151	170	102	130	129	175	125

(*a*) Maize and kaffircorn.
(*b*) Wheat, oats and rye.
(*c*) Lucerne and teff hay.
(*d*) Potatoes, sweet potatoes, onions and dried beans.
(*e*) Wool, mohair, hides and skins
(*f*) Butterfat, cheese milk and condensing milk.
(*g*) Cattle, sheep and pigs.
(*h*) Fowls, turkeys and eggs.

Average Prices of Oranges and Pawpaws on Municipal Markets.

Season (1st April to 31st March).	Oranges (Pocket).							Pawpaws (Standard box).	
	Johannesburg.			Cape Town.		Durban.		Johannesburg.	
	N.M. Navels.	Other. Navels.	Other. Valencias.	Navels.	Valencias.	Navels.	Valencias.	N.M.	Other.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
1938–39	1 10	1 6	1 5	2 0	2 1	—	—	2 0	1 7
1940–41	1 9	1 7	1 6	1 11	1 10	2 4	2 1	2 2	1 9
1941—									
January	—	0 11	1 9	—	1 10	—	2 11	2 6	1 6
February	—	2 2	2 2	—	2 9	—	—	3 7	2 10
April	1 9	1 8	1 5	2 5	1 11	2 1	—	2 7	2 1
May	1 9	1 5	1 4	1 7	1 0	2 2	—	2 0	1 6
June	1 8	1 6	1 3	1 7	—	1 8	—	1 6	1 4
July	1 8	1 7	1 3	1 8	—	1 11	1 6	1 5	1 2
August	2 2	2 2	1 7	1 11	1 6	1 10	1 8	1 11	1 8
September	2 4	2 1	1 9	2 4	1 8	2 6	1 8	1 9	1 5
October	—	1 10	1 11	3 2	1 9	3 5	1 8	2 3	1 10
November	—	2 9	2 8	3 1	2 7	—	2 5	3 2	2 6
December	—	2 9	3 6	—	3 5	—	2 6	3 9	2 7
1942—									
January	—	2 6	3 8	2 10	4 7	—	3 11	3 3	2 1
February	—	3 11	4 5	4 7	6 10	3 9	5 8	6 4	3 3
March	—	3 7	2 11	6 6	5 10	4 3	5 6	4 1	3 1
April	2 1	2 0	1 10	2 4	5 0	3 4	2 6	4 0	3 1

Average Prices of Cabbages, Cauliflower and Tomatoes on Municipal Markets.

Season (1st July to 30th June).	Cabbages (bag). (a)			Cauliflower (bag). (a)			Tomatoes (Trays 15 lb.).			
	Johannesburg.	Cape Town.	Durban.	Johannesburg.	Cape Town.	Durban.	Johannesburg. N.M. No. 1.	Johannesburg. Other.	Cape Town.	Durban.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
1938–39	3 10	3 0	3 10	3 0	1 8	3 5	2 2	1 3	1 8	0 10
1940–41	5 10	4 8	7 1	3 11	4 3	5 3	2 7	1 6	2 1	1 2
1940—										
November	2 9	2 0	3 3	—	2 1	3 5	2 3	1 3	2 6	0 10
December	3 10	1 4	3 6	2 7	1 9	1 0	3 2	1 4	1 11	0 9
1941—										
January	5 7	1 5	4 11	3 10	1 6	—	3 4	1 7	0 11	1 4
February	7 4	3 5	11 9	5 6	4 2	9 6	2 7	1 4	1 5	1 2
March	7 4	4 11	10 10	4 10	4 1	5 5	3 5	1 8	2 2	1 4
April	6 0	5 3	6 10	3 11	3 5	5 1	2 11	1 6	2 5	1 7
May	5 3	4 10	5 5	4 2	4 8	4 9	2 5	1 5	1 10	1 4
June	6 2	5 5	8 2	5 6	4 3	6 10	2 7	1 8	2 6	0 11
July	10 3	5 11	8 0	6 7	6 0	6 8	2 10	1 7	2 4	1 1
August	8 5	4 7	4 8	4 4	4 11	5 5	3 5	2 4	1 11	0 9
September	10 0	6 6	3 8	5 6	6 9	6 7	2 9	1 9	2 2	0 10
October	10 3	7 11	4 2	8 4	6 2	—	2 0	1 1	1 9	0 6
November	11 3	8 1	4 8	—	6 2	—	3 3	1 11	2 10	1 7
1942—										
January	7 7	5 4	9 1	8 1	4 0	—	2 11	1 0	1 6	2 1
February	8 0	6 3	18 3	5 10	—	—	3 6	1 7	1 5	1 5
March	7 3	6 0	22 9	5 6	8 0	—	5 8	2 7	1 3	2 6
April	8 2	4 9	16 3	6 4	5 8	12 6	5 4	2 6	1 8	1 11

(a) Weights of bags vary, but on the average are approximately as follows: For cabbages: Johannesburg, 105 lb., Cape Town 105 lb., and Durban 90 lb. For cauliflower: Johannesburg 100 lb., Cape Town 65 lb., and Durban 85 lb.

G.P.-S.900—1942-3—5,900.

FARMING IN SOUTH ... AFRICA

Vol. 17 JULY, 1942 No. 196

Editorial:

Karoo Manure and Karoo Ash.

A SHORT while ago, in an article to the Press, the Department sounded a serious warning against the use of Karoo ash by farmers. It now appears that certain dealers are offering for sale a so-called 50-50 mixture of manure and ash, in the place of pure Karoo manure, and that they are even making exaggerated claims for the superiority of this mixture over other fertilizers, such as, for example, superphosphate. So extravagant have these claims been that they recently evoked complaints from, among others, wheat-farmers in the Cape Province. This led to the publication of an article specially intended to point out certain dangers attending the use of Karoo manure which are considerably increased by the presence of the ash in the mixture.

This article appears to have given rise to some confusion in the minds of readers who were not acquainted with the specific object of the article. A number of persons have written to inquire whether Karoo manure or a mixture of Karoo manure and Karoo ash does not possess any good qualities at all and whether their use is not justifiable under any circumstances. It has, therefore been deemed advisable to make a few supplementary remarks on the matter.

Good Karoo manure is unquestionably a first-rate article. If that were not the case, why would the Department have arranged for special railage rebates? Furthermore, several articles dealing with the general properties of Karoo manure have already appeared. Take, for example, those by Taylor and de Villiers, published in the February 1941 and May 1942 issues of *Farming in South Africa*. A detailed discussion of the subject is, therefore, unnecessary. It merely remains to point out that, unfortunately, analyses of numerous samples of Karoo manure carried out by the Department in the course of years have revealed that the article sold to farmers is frequently very inferior. At times it was found that more than half the mixture consisted of soil; in some samples combustion was so complete that practically no organic material remained, and many contained appreciable quantities of harmful salts. The greatest caution should, therefore, be exercised at all times by farmers in the purchase and utilization of Karoo manure. Farmers who are accustomed to applying large quantities of natural manure, say, 10 to 25 tons, to their lands or gardens every 3 to 5 years are advised not to use more than 2 to 5 tons of any unknown Karoo manure. If the water supply is good and the manure of good quality, larger quantities of Karoo manure may sometimes be applied very successfully. Manure obtained from so-called "brak" areas, however, generally contains considerable quantities of brackish substances, and it is not an uncommon occurrence for a white layer of brackish salts to appear on the surface of lands irrigated after a liberal application of Karoo

manure. Karoo manure, which has been mixed with ash naturally has a still greater salt content and the mixture is, therefore, all the more dangerous to many crops. The warning issued by the Department referred especially to such cases.

In consequence of the 90 per cent. railage rebate which has been operative in respect of Karoo manure for several years, an enormous demand has arisen for this cheap article. At the present time approximately 400,000 tons are annually transported by rail, as compared with barely 100,000 tons annually prior to the granting of the rebate. The sale of Karoo manure has, therefore, actually become a commercial enterprise, and as may be expected, various methods have been employed to popularize its use. Since farmers had grown accustomed to the practice of applying fertilizers in small quantities by means of a planter, this method was naturally tried out and recommended for the application of Karoo manure. For this to be possible it was, of course, necessary for the manure to be supplied in a ground, sifted state, and the dealers were only too pleased to do this in view of the greater profit obtainable for Karoo manure in bags. The increased consumption of Karoo manure also resulted in attention being paid by interested dealers to old ash heaps, and before long a demand arose for a mixture of manure and ash, since it was alleged that such a mixture would in many respects be superior to pure manure. The price of the mixture of manure and ash is, of course, considerably higher than that of pure manure, and presumably the profits are also considerably higher. The half-truth that the repeated application of superphosphate alone year after year leads to exhaustion of the soil and makes it sour and hard, was also fully exploited. Consequently, it was recommended that superphosphate should be mixed with three parts of ground manure, or better still, with three parts of the manure-ash mixture, for the best results to be obtained. The fact that this advice may in certain cases actually prove fairly useful, contributed still further to the expansion of the trade in Karoo manure and the manure-ash mixture.

This superphosphate-manure-ash-mixture is to-day mainly used by grain-farmers. In many cases the results are alleged to be very good. The quantity used per morgen is usually as much as can pass through the planter when the fertilizer attachment is set at its widest. According to field experiments at Cedara, this amount is approximately 500 lb. per morgen. If, however, even as much as 800 lb. of the mixture were applied per morgen there would be only 200 lb. super, the rest being manure. The warnings given by the Department were in no way intended to convey the impression that such small quantities of Karoo manure and manure-ash mixture constitute a serious danger to crops. In certain cases these quantities may have an adverse effect but, generally speaking, they are too small to be harmful even when their salt content is high. On the other hand, the Department cannot, in the light of present knowledge, subscribe to the claims that these small quantities of manure or manure ash in themselves will have a pronounced beneficial effect on the crop. While there are, admittedly, circumstances in which the addition of the mixture to superphosphate would serve a useful purpose, its general use is not justifiable in the opinion of the Department. It is, however, the intention of the Department to undertake experimental work with regard to this matter, in order to be able at a later stage to express more definite views on the subject.

(Secretary for Agriculture and Forestry.)

Vegetable Production under War Conditions.

THE demand for vegetables has increased very markedly since the advent of the war, and the public press has also given considerable publicity to the necessity of increasing the production of vegetables.

The first problem that presents itself with such an increased production programme, is the matter of seed supply. Elsewhere in this issue this aspect is dealt with more fully in the article "The Production of Vegetable Seed", by H. van Elden, and it is evident that the present is an outstanding opportunity for South Africa to to become largely independent of imports for its vegetable-seed requirements. For that matter, the present affords an opportunity for South Africa to become the supplier of vegetable seeds for all African Territories and certain other foreign countries.

When the necessity for the increased production of vegetables is considered, it is a controversial question as to whether, under our conditions, it is actually the best policy for everybody to undertake or try to undertake the production of his own vegetables in his back garden. It is a well-known fact that the average home gardener is very wasteful in the use of seed. He either sows the seed too thickly, sows it at the wrong time of the year, sows more than is required for his household, or uses poor production methods which result in failure of the crop. Therefore, when home gardeners decide to produce their own vegetables, it is in the interests of the country to prevent all possible wastage of seed, especially when certain vegetable seed is not always available in unlimited quantities.

There is, however, a very important contribution that the home gardener can make towards the vegetable industry of South Africa. There are a numer of different kinds of desirable and appetizing vegetables which are relatively unknown in South Africa. The commercial grower does not produce them to-day, simply because the consumer demand does not exist. The home gardener, by producing such vegetables in small quantities for home use only, would assist in popularizing them. Examples of such vegetables are: Asparagus, bell peppers (exceedingly rich in vitamin "C" and sweet —not "hot"), Brussels sprouts, blanched chicory, blanched celery, sousou (or choko or cho-cho), Chinese cabbage, globe artichokes, okra, salsify, spinach (not chard), and cardoon.

The fertilizing of vegetables is one of the first requirements for success. The question of supplies, however, is causing considerable difficulty to-day since artificial fertilizers are not always procurable in unlimited quantities and cattle manure is scarce. The alternatives to these are mostly compost or Karoo sheep manure. The making of compost is therefore strongly advocated, and bulletins on the subject are obtainable from the Department of Agriculture and Forestry. Karoo manure is still available in fairly large quantities, but growers are warned not to apply such heavy applications of this manure as is the case when cattle manure is used, since the salt or brak usually contained in Karoo manure would be deleterious to plant growth if excessive quantities were applied. When Karoo manure is, however, used in lighter dressings such as 800 to 2,000 lb. per morgen, as is advocated by the more responsible suppliers of this manure, no harm can be done.

The Department of Agriculture and Forestry will be pleased to assist producers or prospective producers with all possible advice on the above matter.

(Dr. F. G. Anderssen, Chief, Division of Horticulture.)

"Dry Root Rot" Disease of Citrus* Trees.

Dr. F. C. Loest, Mycologist, Sub-tropical Horticultural Research Station, Nelspruit.

A ROOT disease of citrus trees known as " dry root rot " has been the cause for the retrogression and death of many citrus trees throughout the Union of South Africa.

Symptoms.

A permanently wilted condition of the leaves develops either on certain sections of the tree [Fig. I (*a*)] or throughout the tree. Some or all the leaves of twigs and branches wilt permanently,

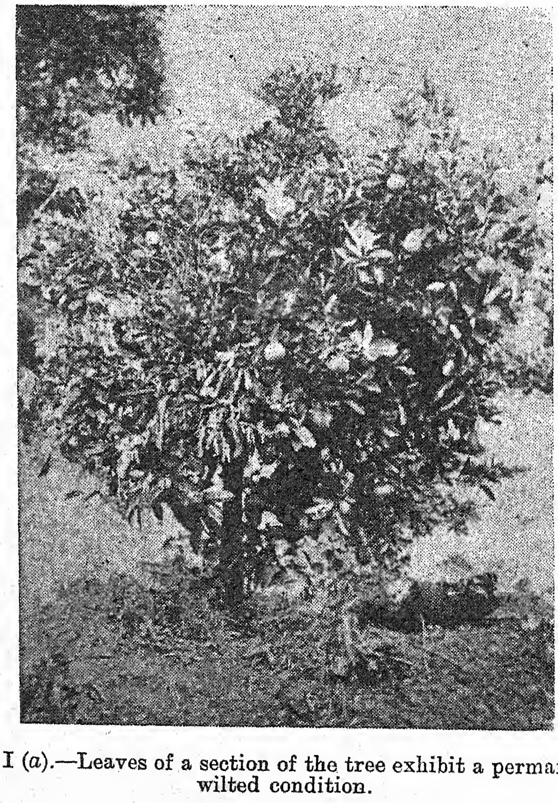


FIG. I (*a*).—Leaves of a section of the tree exhibit a permanently wilted condition.

resulting in complete defoliation of affected branches [Fig. I (*b*)]. Sectional defoliation of the tree may continue over a period of years before the tree as a whole is defoliated and ultimately dies. In other instances, however, the leaves of a section of the tree or of the entire tree may drop without exhibiting a permanently wilted condition. The dropping of such leaves may take place over a short or long period of time. In the latter case, the tree gradually becomes

* (As a full account on this disease will be published later in the form of a bulletin, only a summary of the symptoms, cause, and control is given in this article.)

less densely foliated, exhibiting what is commonly referred to as a " thin " appearance. Undersized leaves, which are usually mottled, often develop on such defoliating branches. Upon examining the root systems of such trees, however, it is often found that the " thin " appearance of the trees is not caused by " dry root rot " but by some fualty nutritional condition.

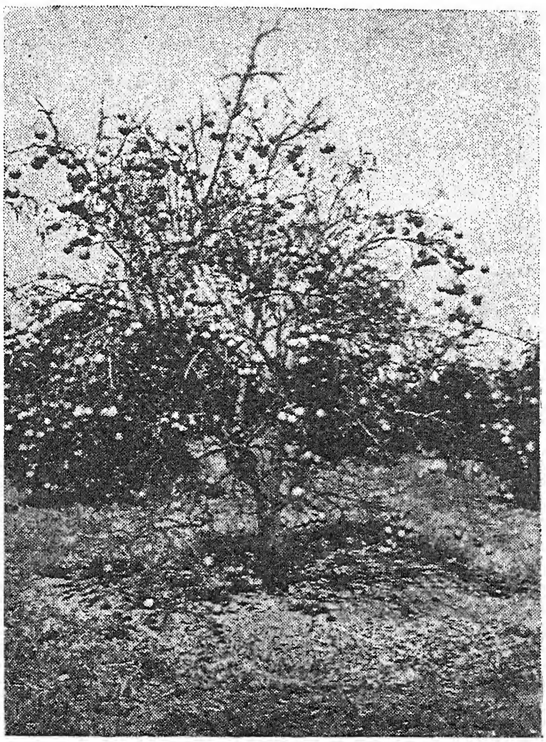


FIG. I (*b*).—A tree which has defoliated completely.

The exudation of gum, in small or large quantities, from cracks in the bark of twigs and branches, which are dying back, is particularly characteristic of Triump grapefruit trees which are attacked by " dry root rot ".

The last remunerative crop borne by a tree attacked by the disease is usually very heavy and is commonly referred to as a " death crop ".

In the initial stages of " dry root rot " the fibrous root system sloughs off, with the result that long secondary roots are found with no fibrous roots. Eventually such roots also decay. Next the crown roots start decaying, and by this stage the bark on the trunk of the tree splits and cracks, resulting in partial or complete collapse of the bark over the whole trunk or a portion of it [Fig. I (*c*)].

The appearance of diseased fibrous secondary and crown roots is similar. The bark becomes detached from the main cylinder, and in the case of secondary and crown roots, it can be easily pulled off in long shreds. This condition of the roots is illustrated in Figs. II (*a*) and II (*b*). The death of the bark is followed by the death of the cambium and wood. In the active and early stages of decay, the bark is soft and moist, but later becomes dry and brittle, the

wood underneath being dead and hard. Eventually the wood becomes corky in appearance and is easily powderel when rubbed between the hands.

When roots are suffering from an advanced stage of the disease, the bark—except the epidermal layer—the cambium, and the wood assume a biscuit, light brown, light dirty brown, pepper, or blackish-

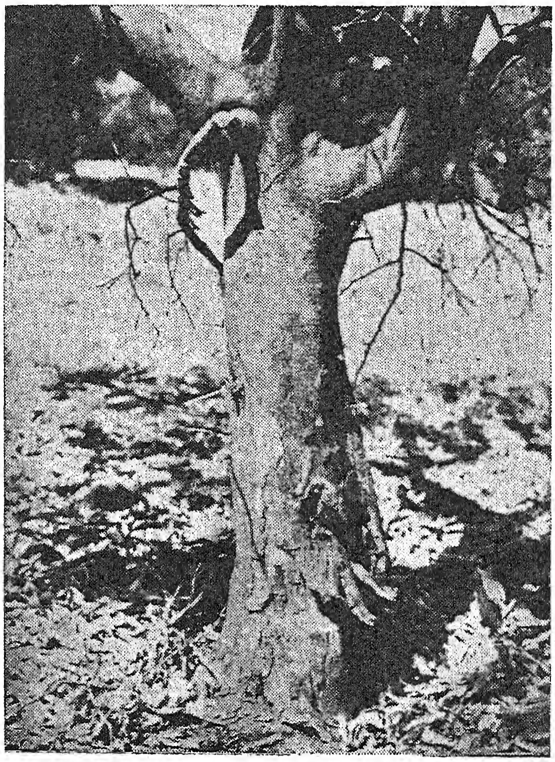


FIG. I (*c*).—Splitting and cracking of the bark on the trunk of the tree in Fig. I (*b*).

grey colour. Often the bark, excepting the epidermal layer, is almost black to jet black in colour. The black bark is often found adhering as a black crust.

Causal Organism.

Although the disease has been well known to citrus growers and to those interested in the science of citriculture, its cause has remained obscure. Recently, however, it was proved by the author that the disease is caused by a fungus, *Diplodia natalensis,* which attacks and destroys the root system of citrus trees.

Contributing Conditions.

Observations throughout the citrus growing areas of the Union of South Africa have established the fact that the main contributing conditions to the incidence of " dry root rot " in cirtus orchards are the following, singly or in any combination:—

(1) An impaired aeration of soils brought about by over-irrigation; especially the over-irrigation of either heavy soils or any soils possessed of hardpans or impervious sub-soils.

(2) A low nitrogen level brought about by leaching available nitrogen beyond the root zone through over-irrigation.

(3) Other contributing conditions such as the planting of inherently " weak " trees or the excessive pruning of roots when cultivating orchards.

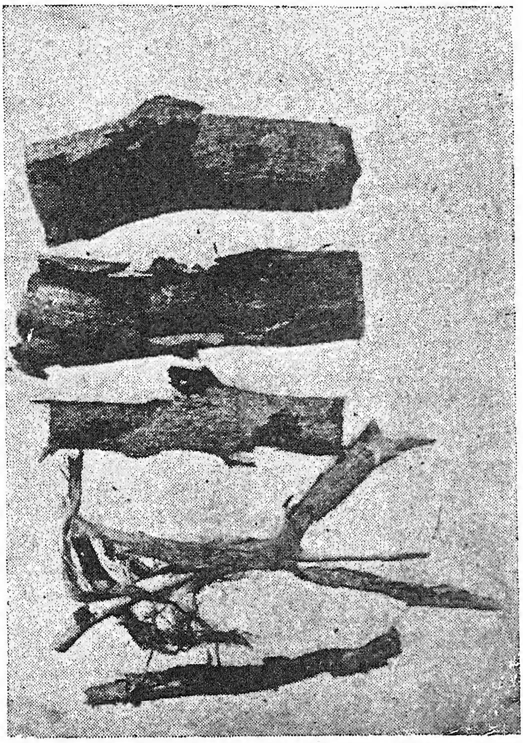


Fig. I.—Citrus trees attacked by " dry root rot ".

By means of a field experiment it was proved that by over-irrigating previously healthy and vigorously growing mature Triump grapefruit trees over a period of years, the trees developed " dry root rot ". In the same experiment, the soil, under a treatment consisting of normal irrigation and fertilized almost exclusively with kraal manure and sulphate of ammonia, became acidified to a comparatively marked degree. As the trees under this treatment temporarily developed severe " dry root rot ", but later again recovered under the same treatment, it became evident, that while much is known in regard to the conditions which pre-dispose the roots of citrus trees to attack by the fungus, this phase of the problem is not as yet fully understood, and deserves further investigation.

Prevention and Control.

It has been shown that the causal organism, *Diplodia natalensis*, although capable of producing the disease when inoculated into the healthy roots of vigorously growing citrus trees, only progresses varying distances along such roots and such roots only. It is,

therefore, evident that in order to prevent the organism from destroying the roots of citrus trees, everything possible should be done to keep the trees in as vigorous a state of health as possible. Methods of prevention which aim at the elimination of the main conditions contributing to the incidence of " dry root rot " may be summarised as follows:—

(1) Avoid planting trees to a soil with an impervious sub-soil.

(2) Do not cultivate a soil before it is sufficiently dry and so avoid the formation of a hardpan.

(3) Beware of an excessive supply of water to the soil through over-irrigation, uncontrolled irrigation, seepage of water, and the planting between the trees of inter-or catch-crops, the frequent water requirements of which are liable to result in an over-irrigation of the citrus roots.

(4) Avoid as much as possible the severance, partial severance, or bruising of the root system when cultivating orchards.

(5) Keep trees supplied with a sufficient amount of available nitrogen necessary for the normal development of the tree.

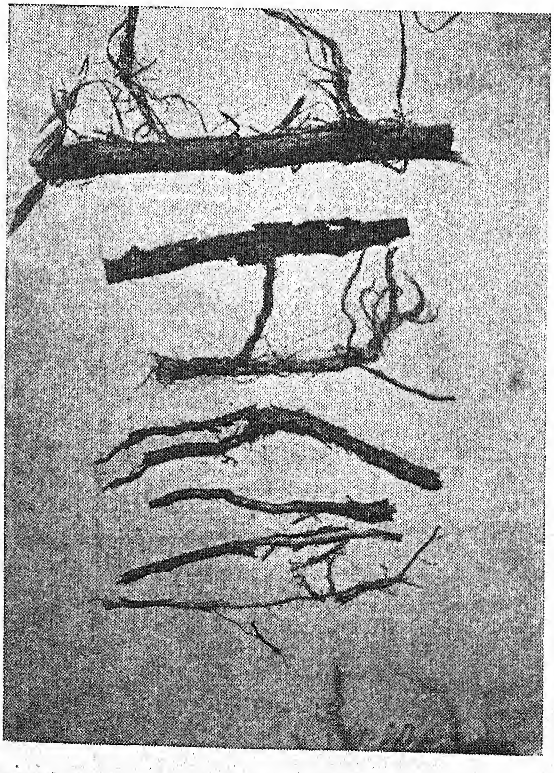


FIG. II.—Characteristic appearance of citrus roots attacked by " dry root rot ".

By preventing the further over-irrigation and by the application of sufficient quantities of available nitrogen, many citrus trees suffering from " dry root rot ", in the early stages of the disease, in either sections of orchards or orchards as a whole, have recovered in due course. To control the disease in its advanced stages is not only a slow process but is often impossible.

The Production of Vegetable Seed.

H. van Elden, Division of Horticulture, Department of Agriculture and Forestry.

ALTHOUGH up to the present South Africa has been largely dependent upon imports from overseas for its vegetable-seed requirements, the position with regard to stocks of vegetable seeds in South Africa is not as critical as one might have expected in the present circumstances. This is largely due to foresight on the part of seed merchants and to stimulated local production. Nevertheless, more can still be done, especially by farmers and gardeners, to ensure that present stocks last as long as possible and that they are augumented by locally produced seed.

When, for example, it is realised that approximately 20 tons of carrot seed was sold in South Africa in 1941, mostly in the form of seed packets containing less than an ounce of seed, it will be clear that every effort should be made to economise in the purchase of seed so that existing stocks will go further and give everyone the opportunity of acquiring his favourite vegetable varieties when required. To do this, avoid using more seed than is actually needed to plant a definite acreage.

The catalogues of several seed merchants, as well as leaflets and bulletins issued by the Department, state the exact quantities of seed of the different vegetables to be used per length of drill or per acre. Planting a given area in drills rather than by broadcasting the seed means a saving in the quantity of seed used and also entails less work in cultivating and keeping down weed growth, less thinning, easier control of pests and the development of sturdier and healthier plants.

Seeds vary according to kind and variety in their viability after varying periods of storage. Fortunately, most vegetable seeds retain their viability for from 1 to 5 years. So, for example, parsley, parsnip and salsify seeds retain their viability for only 1 year. Pepper, onion and leek seed can be kept for two years; asparagus, beans, carrot, celery, kohlrabi, maize, peas and spinach for 3 years; beet, broccoli, cabbage, cauliflower, pumpkin, radish, squash, swiss chard, tomato and turnip for 4 years, and cucumber, eggplant, endive, lettuce, musk melon and watermelon for 5 years.

It is therefore not always necessary to purchase fresh seed every year. Seed left over for later use is best stored in lever-lid tins, empty spray drums with screw-down lids or in glass fruit jars in order to keep out rodents, weevils and other pests.

Vegetable Seed Production.

The old belief among market gardeners that fresh stocks of vegetable seeds had to be imported from abroad every year in order to avoid deterioration and degeneration in varieties is rapidly losing ground since certain lines of vegetable seeds, such as beans, tomatoes, peas, pumpkin, cauliflower, leek, squash, carrot and onion are being produced just as successfully in this country by reliable seed growers specialising in the culture of a particular kind of variety of vegetable seed.

Growers who are interested in or contemplating the production of seed for their own use or for sale can render a valuable national service by confining themselves to one or only a few kinds of vegetables to which they are able to give their full personal attention. Such vegetables should be those best suited to their local conditions and not requiring a complicated breeding technique to yield the desired results. The following points may be helpful as a guide:—

Insect Pests and Diseases.—Sow or plant on new, clean land and rigorously control diseases and insect pests.

Individual Plant Selection.—Select within a planting of a particular vegetable, those plants that exhibit desirable characteristics as to yield, earliness, vigor, quality, trueness to type, resistance to disease, and mark these as seed producers.

Mass Selection.—Alternatively, where on a larger scale, a particularly fine uniform planting is earmarked for seed, or propagated under contract for a seed merchant, go through the planting at least twice if not more often, especially when the particular vegetable is in prime condition for consumption and again later just before harvesting the seed, and rogue out any undesirable plants.

A combination of the above two systems may be employed. Be sure first to obtain the most desirable type and then increase this type to get sufficient seed. The purity or desirability of the selection can be determined by the amount of roguing necessary in the field. Very often seed merchants undertake to supply their seed growers with selected seed already thoroughly tested, so that mass selection only need be considered.

This method may appear more laborious than simply selecting the best looking tomato fruit or best seed beans from the picking bag, but it will certainly repay the trouble taken. An unsightly bird-eaten tomato from a high yielding plant may, from the point of view of selection, be a more desirable fruit to use for seed than a good-looking tomato representing the total crop of one plant. Hence the particular need for field roguing or field selection.

Cross-pollination.—Beans, brinjals (eggfruit), endive, lettuce, capsicums, and tomatoes are usually self-pollinating. Cross-pollination may occur but never amounts to more than 5 per cent., which for practical purposes may be ignored.

Selection as suggested above can be applied within these groups without anxiety as to contamination or deterioration of varieties through cross-pollination.

Cucurbits (pumpkin, squash, cucumber), carrots, parsnips and celery are self-fertile. Nevertheless, cross-pollination may often occur under natural conditions.

Asparagus, beet, broccoli, cabbage, cauliflower, kohlrabi, onion, radish, spinach are naturally cross-pollinating.

Any plantings made of the easily cross-pollinated or naturally cross-pollinated vegetable types must be widely separated in order to prevent cross-pollination, or other precautions must be taken to achieve the same object. These may include the planting of varieties at different dates so that the flowering periods do not coincide.

Beans, Peas, Brinjals (Eggfruits), Capsicums, Tomatoes, Lettuce, Endive.

By individual and mass selection varieties of uniform type and bearing can be obtained without much difficulty.

Beans: French Beans.—Since bean seed may carry the seed-borne disease, bacterial wilt, be sure that the seed contains no malformed, defective or discoloured beans. Select stringless, disease free, high yielding types which bear early and over as long a period as possible. Pods should be long and free from blemishes due to other than insect or accidental injury, and typical of the variety. Harvest at one time when the pods are dry. Yields of 2,000-3,000 lb. per morgen can be expected.

Peas.—Select as for beans. The yields should be approximately 2,000-3,500 lb. per morgen, depending upon variety.

Brinjals (egg fruit).—The market prefers a large deep-purple fruit. Unfortunately, brinjals segregate for colour and in commercial plantings one frequently finds plants yielding light coloured or even yellow fruits. Such plants should be removed. Furthermore, brinjals are highly susceptible to fusarium wilt, and it is therefore necessary to remove all diseased plants before any fruit is picked for seed. Harvest as the fruits mature.

Capsicums.—Two kinds are grown in this country, namely, the red chilli or "hot" kind of capsicum, and the "bell" pepper or "sweet" capsicum.

The former should be selected for their pungency, uniform shape and size typical of the variety. The uses to which red chillies are put, whether for condiments, pickles, relishes or medicinal purposes, will determine the size to be selected. "Bell" peppers or "sweet" capsicums are selected for their uniformity of shape, thick flesh and mild flavour. Malformed, misshapen fruits often occur and as these abnormalities are usually heritable, it is desirable to rogue out any plants bearing distinctly lopsided or misshapen fruits.

Capsicums, like brinjals, are subject to fusarium wilt and any diseased plants should be removed. Harvest as the fruits mature.

Tomatoes.—Select plants for yield, vigour, resistance to disease, continuous cropping and for uniformly shaped, firm-fleshed fruits. Rogue out diseased plants or those not bearing desirable crops. Harvest as the fruits mature. Roughly 4 lb. of seed can be obtained from 1,000 lb. of fruit.

Lettuce and endive.—For seed-production purposes, lettuce and endive are sown in late summer as the seed sets better in spring. To minimise the danger of loss of seed by shattering, seed-heads should be harvested during the early morning hours while the dew is still on the plants.

Be sure that lettuce and endive seed are fully mature, since these plants are prone to produce infertile seed under certain conditions.

Broccoli, Cabbage, Cauliflower, Kale, Kohlrabi.

Grow, if possible, only one variety of any of these crops in order to prevent cross-pollination among varieties. Sterilise the seed before sowing to prevent the introduction of such seed-borne diseases as heart rot in cabbages. Rigorous selection and field roguing is essential.

Sow and plant late enough in the season so that the plants will mature during winter and not produce seed-heads before spring. Cold weather seriously affects seed-setting, while hot weather, on the other hand, favours plant aphides and other insect pests.

Cabbages.—To allow the seed-heads to develop normally in cabbages, it is necessary to make a cross-cut in the upper leaves, care being exercised not to injure the heart. Collect the seed-heads as soon as they begin to turn yellow. Bucksails will be found most useful for drying the seed-heads as any seed which may shatter is easily collected.

Where climatic conditions are unfavourable or it is uneconomical to maintain a relatively small proportion of selected plants in the field or where disease and insect pests such as eelworm are likely to retard seriously the growth of plants left too long on the land, desirable plants can be lifted and transplanted to new, prepared ground to seed there. Generally 20-25 cabbage plants are required to produce 1 lb. of seed. Select for uniformity of type, firm head, early maturity and resistance to disease.

Another method which can be followed with cabbages is to leave the stumps of desirable plants to produce new growth and seed-heads after the heads have been marketed.

Cauliflower and Broccoli.—Apart from freedom from disease, the types selected should have a large, uniform, compact, white head without leaves growing through it and without any " fuzziness ".

Kale.—Select early-maturing types bearing large leaves with as little midrib as possible.

Kohlrabi.—Select for trueness to type depending on variety and earliness.

Carrots, Beet, Swiss Chard, Parsnips, Radishes, Turnips and Onions.

Sow during the latter half of summer and early enough to enable the roots to mature before winter. Thinning and roguing should be practised during field inspections. When the crop is lifted during winter, the most desirable and shapely roots having no cracks, side roots, open cores or undesirable features should be selected. Where frost is severe, store the roots temporarily in slightly moist sand in a cool, dry place until required for replanting for seed production in spring. Otherwise simply lift the roots in late winter, remove the foliage by cutting and not twisting it off and then, after inspection, transplant the most desirable roots by digging them in with a spade or setting them in a plough furrow behind the plough. Space the roots 18-30 inches apart in the rows and 3 feet apart between rows. As previously mentioned, cross-pollination may occur between varieties.

Radish and turnip seed is harvested as described for cabbages. Carrot and parsnip seed-heads do not all ripen at the same time, so that it will be necessary to harvest as the heads mature. The average yield of seed is 800 to 1,000 lb. per morgen.

Beet seed is harvested when most of the seed-stalks turn brown. The correct stage can be determined only by experience, as the seed will be of poor quality when harvested too soon, and shattering will cause considerable losses if the seed is harvested when too ripe. Allow the seed-heads to dry on bucksails and then thrash.

Swiss Chard.—treated in the same way as beet.

Onions.—Select the best, uniformly coloured, well-matured onions. Grade according to size of bulb before planting in order to ensure that the plants will flower evenly and cross pollinate each other. Plant in rows 24-30 inches apart and 12 inches apart in the rows, depending on the methods of cultivation employed.

As the long, slender seed-stalks break off very easily, it is necessary to protect them against strong winds either by ridging, throwing up the earth against the plants, staking, or providing some sort of support for the seed-heads. Harvest individual seed-heads, leaving about 6 inches of the stalk attached for convenient handling and proper curing as soon as they turn yellow to prevent shattering of seed. Repeated harvesting of seed-heads is necessary as they ripen unevenly. Approximately 600 lb. of seed can be obtained per morgen Attention must be drawn to the fact that onions may produce seed-heads prematurely. This is referred to as "bolting" and is a most undesirable feature from the point of view of bulb production and good keeping qualities. Consequently any seed-heads prematurely produced should be discarded and not used for seed. With some varieties such as "Yellow Burmuda" one occasionally finds blue-grey or violet-coloured bulbs which show up particularly after cold weather. Such bulbs should under no circumstances be used for seed production.

Leeks.—The same technique as for onions can be followed except that the plants are usually not transplanted and only the inferior or undesirable plants rogued out.

Cucurbits:—Pumpkin, Squash, Sweet Melon, Spaanspek, Watermelon, Cucumber.

Since cucurbits may cross-pollinate, it is desirable to have varieties widely separated. Although pumpkins and cucumbers, pumpkins and watermelons, pumpkins and squashes do not cross-pollinate, it is advisable to keep lands free of any wild cucurbit weeds as some of these are known to cross readily with cultivated types. When it is difficult to distinquish vines from one another where they are intertwined, select the best hills and stake these so that they are easily identified later when their cropping qualities and freedom from disease can be determined.

If part of the crop is to be sold in the fresh state, make sure that the fruit left for seed is borne on desirable high-yielding plants.

Yield of seed in the cucurbits varies greatly according to variety; 12 to 16 watermelons are required to produce approximately 1 lb. of seed. Cucumbers will yield approximately 360 lb. of seed per morgen.

Pumpkins and Squashes.—Several vareties of pumpkin and squash are commonly grown and vary in shape, size and colour. Select the best plants bearing fruit typical of the variety.

Sweet Melon, Muskmelon, Watermelon.—Select the best plants bearing fruit typical of the variety. Rather select for medium-sized fruit, early cropping, high yield and quality.

Honey-dew melons should have a creamy white flesh, with as little green showing as possible, while sweet melons and muskmelons should have a deep orange and watermelons a deep red flesh colour.

Cucumbers.—The market requires a cucumber of uniform shape and size, green in colour and of firm tetxure.

When selecting desirable hills pay especial attention to colour and size, green in colour and of firm texture.

Extraction, Thrashing and Cleaning of Seed.

Although machinery is being used by seedsmen for cleaning and removing the finer impurities in seed, clean, evenly graded seed of uniform colour is still being sold at a premium. It will, therefore, compensate the seedgrower to give particular attention to this point.

Seed from Egg-fruit, Tomatoes, Cucurbits.—Seed of the tomato, brinjal and cucurbits is scooped from the ripe fruits and placed in suitable containers such as a barrel or drum and left to ferment. Add water if necessary so that the seed mass can be stirred from time to time with a wooden pole. Allow the mass to stand for a few days until the fruit pulp easily separates from the seed. Now wash and clean the seed in a sieve and remove all the fruit flesh. Spread the seed out in a thin layer on sacking or other suitable material and allow to dry in the shade so as not to impair the viability of the seed. The fermentation process should be for as short a period as possible. The seed should be washed immediately in clear water and dried rapidly, otherwise it may become discoloured. Tomatoes are usually fermented for only two days, while cucumbers can safely be left for 4-5 days.

Seed from Beans, Peas, Carrots, Beet, Cabbages.—Suitable thrashing machines are available for only a few of the vegetables like beans and peas. Most of the other kinds will have to be thrashed by hand by placing the seedheads in bags and beating them out.

In conclusion, it must be pointed out that although growers can, as suggested above, maintain their seed stock up to a high standard by mass selection, new desirable characteristics cannot be incorporated or combined in a crop merely by mass selection. To accomplish this, a more carefully planned breeding programme, involving a complicated breeding technique followed by individual plant and mass selection will have to be practised.

If growers desire further information this can be obtained on application to the Division of Horticulture.

Concentrates for Dairy Cows.

IN order to obviate unnecessary wastage of hay and concentrates, a few important points must be borne in mind.

All cows which are not economical producers must be eliminated from the dairy herd.

Cows giving 1 gallon of milk or less per day shoul dnot receive any concentrate unless they have reached an advanced stage of pregnancy.

Cows producing approximately 1 gallon of milk per day may be fed on good hay and silage, while animals yielding 2 gallons of milk per day may receive 2 lb. of concentrate.

Cows producing more than 2 gallons of milk per day, should receive 3 lb. of concentrate for every gallon of milk produced in excess of one gallon, i.e. a 4-gallon cow should receive 9 lb. concentrate per day.

[*Continued on page* 438.

A South African Wool Factory.

The Manufacture of Tops from Merino Wool.

Dr. V. Bosman and S. D. Rossouw, Wool Research Laboratories, Onderstepoort.

SOUTH AFRICA produces about 250,000,000 pounds of grease wool per annum and this industry constitutes the largest of our pastoral pursuits. According to statistics there are about 44,000 wool farmers in the Union and it is estimated that the capital invested in the industry is approximately £160 million.

The South African wool clip is marketed and exported in the greasy state* to countries which manufacture the raw wool into cloth. Practically all the textile requirements of the Union are imported, with the exception of products such as blankets which are manufactured at the existing "woollen" mills.

In recent years many discussions and resolutions favouring the establishment of wool factories in the Union have emanated from Wool Farmers' Meetings and Congresses. It is often argued that the processing of South African wool should be undertaken in the Union. In view of the abundant raw material in the country, South Africa should not have to import all its textile requirements and in addition lose the benefits of such a secondary industry.

Many pros and cons, as far as the establishment of wool factories in the Union is concerned, have already become evident and, since wool farmers have shown such a keen interest in the venture, some facts as they present themselves are here outlined.

The Nature of South African Wool.

The nature of the raw material from which fabrics are made largely determines the characteristics of the finished cloths. For this reason it is important to consider South African wool in relation to its basic characteristics, and laboratory researches have already shown to what degree the most important wool characteristics are developed in South African wool.(1)

It has, for instance, been demonstrated that South African wool is particularly fine-fibred. It has a good tensile strength and felting power. It is durable and has a good whiteness.(2).

Furthermore, the wool farmer has, in recent years, improved upon the classification of his clip, so that standard grades of wool which are based mainly on length and fibre fineness, now characterise the clip.

In summary, the nature of South African wool, mainly due to its fibre fineness and associated characteristics makes this product eminently suited for the requirements of a worsted wool industry.(3)

* A small portion of the clip is washed at local wool washeries.

(1) The investigations have been financed by the South African Wool Council out of Wool-Levy Funds and the work was undertaken at the Onderstepoort Wool-Research Laboratories.

(2) Other characteristics of South African wool are described in "Superiority of South African Wool Emphasised by Research"—V. Bosman, "The Organised Wool Farmer", April-July, 1939.

(3) The existing "Woollen" factories in South Africa are mainly concerned with the manufacture of blankets and other "woollen" materials. There is as yet no worsted factory.

The Present Position.

Available figures of textile imports show that the Union of South Africa, with its small European population of 2 million and its non-European population of 8 million, can be expected to consume barely one-tenth of its own wool, so that at least 90 per cent of the South African clip must be exported. This means that South Africa must market 90 per cent. of its wool by one or more of the following methods: (*a*) in the raw state as greasy wool; (*b*) in the semi-manufactured state (scoured wool, or tops or yarn); and (*c*) in the manufactured state as cloth or garments.

At present the greasy wool is exported to countries of manufacture where the subsequent processing is undertaken by different concerns. For example, the topmaker, after washing and combing, passes his tops to firms who undertake the spinning, weaving and finishing.

The possibility of manufacturing the raw wool into finished articles has been considered, but in view of the many difficulties confronting a complete worsted industry (cited hereunder), it is reasonable to assume that, should the South African clip be processed on a national basis, its manufacture to the top-stage would be the primary venture.

Disadvantages of Manufacturing the S.A. Clip into Finished Clothing.

Woolgrowers and others have expressed the view that the South African wool clip should be processed into articles ready for use to the consumer. Such a scheme presents several difficulties:—

(1) Ninety per cent. of such goods would have to be exported and come into competition on the world's textile markets with goods from long-established industries.

(2) If a portion of the clip is processed for consumption in South Africa, it would not be economical to cater for the variety of articles demanded for the small South African market. Only lines for which there is a sufficiently large demand could be manufactured economically.

(3) The articles, whether piecegoods or knitgoods, will be of "all-wool" and will often have to compete with cheaper synthetic fibre or cotton products, and mixtures of these with wool.

(4) Many worsted lines are consumed on the demands of fashion, especially in women's wear, and this may result in an accumulation of unsold stocks.

(5) Many patterns and frequent changes of patterns would be required for the different types of fabrics in demand. The changing of patterns is often an expensive item and advances the costs of manufacture.

(6) The worsted industry, and especially the portion from the top-stage to finished products, is a highly specialised one and a South African venture would be competitive with long-established overseas concerns. Many technicians would have to be imported into key positions.

(7) The capital outlay for a complete worsted plant (which is an economic unit) would run into a few million pounds, whereas that for a top-making industry is small in comparison.

Advantages of Producing Merino-Wool Tops in South Africa.

1. *The Disposal of Wool Tops.*—(*a*) Tops can be marketed in an export trade, a system already practised on an international basis. Trade journals (before the war) contended that there was a brisk international trade in wool tops with a marked tendency for certain countries to increase this trade.

Merino tops are used in the worsted industry and often with blends of tops from other sources. It is also used for blending purposes in the synthetic fibre industry, e.g., Vistra and Rayon, and in the Casein fibre industry, e.g., Lanital. It has been shown that Merino wool, and especially South African Merino wool, by virtue of certain characteristics, is particularly suitable for blending with synthetic fibres and cotton, and with the conception that the greater the percentage of wool in mixtures, the better is the cloth, the consumption of Merino wool in articles other than pure wool is an important aspect in a scheme of processing such as is outlined here.*

(*b*) *For the Local Secondary Industries.*—Tops can be supplied (either separately or associated with the wool-top concern) which would cater for local consumption of wool products, or for an export trade, if necessary. Lines that suggest themselves are the following:—

- (i) Knitting wool, of which an appreciable quantity is at present imported.
- (ii) Wool yarn for knitgoods-factories, e.g., socks, pullovers, etc.
- (iii) Plain piecegoods (flannels and serges) of which an appreciable quantity is consumed in South Africa.
- (iv) Noil as a by-product of the top-industry is largely used in the hat industry and at present there is a good demand for this in South Africa.

It is believed that, if wool tops can be readily obtained in South Africa, at competitive prices, a stimulus will be given to secondary concerns that require tops.

2. *Capital Outlay.*—The capital outlay on plant for Tops is relatively small. A small economic unit which would process about 50,000 bales of grease wool per annum (about one-sixteenth of the South African wool clip) will cost only one-tenth of the complete worsted plant.

* According to the Imperial Economic Committee during 1938-39, the world production Textile Fibres was as follows:—

	Wool (Clean Scoured).	Synthetic Fibres.	Cotton.
Weight in million pounds..................	1,560	1,974	14,064

3. *Favourable Costs of Conversion.*—A South African produced Top has several factors favouring its cheaper production in South Africa than overseas:—

(*a*) Pressing charges for exporting wool in the grease, and amounting to about ½d. per lb. in the Top stage, are eliminated.

(b) Handling and freight is reduced by at least one-half, since, when Tops are exported, more than one-half of the foreign matter (sand, grease, suint, etc.) in the greasy wool has been taken out. Tops sold to local concerns would benefit by these charges and, in addition, by an amount equivalent to the return journey costs of the Tops to South Africa.

(c) Sorting and blending costs in South Africa are not at a disadvantage in comparison with those prevailing overseas.

(d) (i) By adopting the latest suint-scouring method, considerable saving in soap and soda can be brought about. In this method little or no soap is bought, and a small quantity may actually become available for sale. The scouring costs are thus appreciably reduced.

(ii) The recovery of the by-products of wool-grease and potash salts from the scouring liquors is visualised. Greasy wool contains about 15 per cent. of wool-grease, selling at about £20 per ton (pre-war) and about 2·5 per cent. of potash salts (as potassium) selling at about £40 per ton (pre-war).

At present the wool farmer gets no remuneration for the wool-grease or the potash salts in his wool clip, although it is estimated that every 100 sheep produce about 20s. worth of wool-grease per annum and, in addition, about 7s. worth of potash salts per annum.* About sixty per cent. of the grease and practically all the potash are normally recoverable from the wool washery.

The handling and scouring costs in South Africa show important advantages over those of processing the wool overseas. The combing charges should not be higher than those overseas. In summary, the South African produced Top should compete very favourably and should be available at a lower price than that produced overseas.

4. Shipping requirements are reduced by exporting Tops instead of the greasy wool.

5. The labour to the Top-stage is considerably less specialised than that from the Top-stage to the finished cloth.

6. The many difficulties (already enumerated) of marketing ready-made wool articles disappear in the marketing of Tops.

7. Tops can be stored for long periods without the same deterioration as that experienced with greasy wools.

8. The costs of changing patterns in the weaving plant and the difficulties of keeping contact with overseas fashion demands do not concern the Topmaker.

Although there are these advantages in the establishment of a Top-factory for South Africa, there are some disadvantages which are, however, not insurmountable.

* Wool grease is used commercially in a number of industries, e.g., the leather industry; rubber and rope industries; for floor and furniture polishes; soap and paint industries; as lubricant, anti-corrosive and rust-preventive in the engineering industry; for cosmetics and drugs; in inks in the printing industry, etc.

The potash salts are invaluable as fertilizers. There is also a good demand for chemical potash such as is used in the soap and match industries.

Disadvantages of Producing Tops in South Africa.

1. The initial cost of the factory would be higher in South Africa than overseas. This, however, is not considered a serious drawback on the basis of percentage outlay of capital.

2. In the beginning, technicians would have to be imported into the necessary key positions.

3. Experience in Top-making would have to be built up, and South African Tops have to be standardised and popularised.

4. Some overseas firms that buy our wool prefer to buy greasy wool because—

(*a*) processing industries have been established in their own countries and create employment and internal money circulation.

(*b*) wool-grease and potash salts are recoverable as by-products.

Preliminary Investigations.

A careful weighing up of the pros and cons of a wool factory for South Africa shows the definite advantages associated with a South African Wool-Top Factory. Preliminary work that has a bearing on the problem from wool technical aspects has been undertaken:

(*a*) Laboratory work on South African wool, as it concerns the nature of the raw material, has produced information useful in the standardisation of Tops.

(*b*) Improved methods of wool scouring have been investigated.

(*c*) Research work on wool grease and potash salts and methods of their recovery at wool washeries has been undertaken (detailed reports are pending).

An essential requisite in the progress of a Wool-Top factory, such as is visualised, is the standardisation of the final products, and it would be necessary to standardise different tops on length, fibre finess, moisture content (tops are sold with definite moisture content) and other physical properties. Experience in such testing has already been gained at the Onderstepoort Wool-Research Laboratories, and should be useful in the development of a Top-industry.

The summarised version of some of the preliminary investigations as they affect the wool side of a wool factory is here outlined, Other questions relating to sites, machinery, the quality of the water, labour, power (coal, electricity), air humidity, and others do not lie within the scope of this investigation.

Popular Bulletins.

(1) Calf Rearing—Bulletin No. 224. Price 3d. Obtainable from the Editor, Department of Agriculture and Forestry, Pretoria.

(2) The Export of Fresh Grapes from the Union of South Africa during the Ten-year period, 1930-39—Bulletin 225. Price 6d. Obtainable from the Chief, Division of Horticulture, Pretoria.

(3) Soft Cheese as a Food—Bulletin No. 229. Price 3d. Obtainable from the Editor, Department of Agriculture and Forestry, Pretoria.

Feed for Dairy Cows in Winter.

Owing to the relative scarcity of concentrates, available supplies should be used with care in order to derive the greatest benefit.

If high-producing cows are deprived of part of their concentrate rations in order that low-producing animals may receive a little extra, the chances are that the aggregate production of the herd will be reduced.

In order to maintain milk-production at the desired level during the winter months the dairy farmer should do his utmost to arrange matters in such a way that the maximum total production will be secured.

In addition to the food required for body maintenance and the replacement of continuous cell-wastage, the dairy cow requires a certain amount of different nutrients for milk production. In normal circumstances the animal is able to derive sufficient strength from the ordinary feeds produced on most farms, such as different kinds of hay, silage, green winter feed, turnips, pumpkins, etc., to remain in good condition and even to produce a small amount of milk.

During the summer months many cows will admittedly yield 20 lb. or more of milk per day without receiving any concentrates, but this is not the case during winter.

Scientific research workers have long ago determined how much concentrates of a given composition a cow requires to enable her to produce an extra gallon of milk. It is not yet possible, however, to predict whether the animal will in fact be *able* to give an additional gallon of milk if she receives the required amount of concentrates.

Concentrates used by one cow to produce more milk will be used by another animal for the formation of flesh and fat, and since there is no abundance of concentrates at present, it is undesirable to use this type of feed in an attemp to produce slaughter animals from poor dairy cows.

In order to obtain the best results the farmer must know when each individuaul cow in his stable reaches the absolute maximum of economic milk production since any increase in the concentrates ration will thereafter mean a financial loss.

It will, therefore, be necessary for the owner to keep careful record of the exact amount of feed given to each cow and of the quantity of milk produced by each individual animal. In hundreds of stables this is a regular practice, but in perhaps more stables the cows are simply fed haphazardly, with the result that many cows do not receive sufficient concentrates while others receive quantities in excess of what they are able to convert into milk. Now is the time, therefore, when farmers should go through their herds and eliminate all uneconomic producers so that good producers may with the aid of the available concentrate be brought to full production.

(L. J. Veenstra, Division of Dairying.)

The Department still recieves applications for the "Handbook for Farmers", although the book has been out of print for more than a year. Under present conditions there is no possibility of having the book reprinted, but should circumstances later on permit it, the public will be notified to that effect.

Seed Maize for the Coming Season.

Dr. A. R. Saunders, Deputy Director of Production.

IN the production of any crop the farmer is largely dependent upon the beneficence of Nature, but still there are certain factors which are under his own control, and none more definitely so, than the provision of good seed in sufficient quantities to allow for all emergencies.

Naturally, this is a matter affecting the production of all crops, but this article will be confined only to maize, since maize is the pivot around which the whole problem of human nutrition and animal feeding in this country revolves, and if adequate supplies of this crop can be produced in the coming season, many other difficulties of food supply will fall away.

Varieties and Quality.

Timely and liberal provision for next season's requirements in respect of seed maize is a self-evident necessity, but quantity is not the only consideration: *Quality* and the correct *choice of variety* are equally important. As regards the latter, farmers, generally, are well acquainted with the merits or demerits of different varieties under their local conditions, and the best advice which can be given is that farmers should grow those varieties with which they have obtained the best results in the past. At the same time, it would be wise to have on hand also seed of varieties specially suitable for late planting, in case conditions are unfavourable at the normal planting time, owing to lack of rain. A repetition of the state of affairs which obtained last season, when many farmers had to rush around at the last moment to find suitable seed, often without success, should be avoided at all costs.

By quality of seed is meant essentially its breeding and freedom from disease. Numerous machines are in use for sorting out maize seed to a uniform size so as to facilitate evenness of planting, but uniformity of size is not synonymous with good quality, and selection by hand is the only method to employ if the best results are to be obtained.

Selection on the Land.

From the point of view of improving the inherent properties of any variety, or of hastening its adaptation to particular conditions of soil and climate, selection should preferably be done in the field so that the character of the parental plants can be properly assessed. Good ears are frequently borne on plants, which are vigorous merely because they have not had to withstand serious competition from others; hence, the best plants from which to select are those in a normal stand. Besides ability to endure competition, stoutness of stem, strength of root system as shown by erectness of growth, good covering of the ears by the husks, and the absence of abnormalities and disease, are commendable features.

If the ears are already harvested, the scope of selection is more limited, but nevertheless sufficiently wide to ensure good viability

and freedom from disease in the seed. All ears showing signs of rot, especially when accompanied by pinkish or greyish discolouration of the grain or in the base of the cob, should be vigorously discarded. The most important diseases of maize are seed borne, and even a slight infection on a portion of an ear usually means that all the grain on that ear is unfit for seed.

Other points to consider are plumpness of the grain, good filling of the ear and the absence of injury to the tip by moisture, insects or birds. Several diseases enter the ear through exposed tips, and the only way to counteract the tendency towards exposure, is to select for good covering by the husks. Matters such as straightness of kernel rows, width of sulci and depth of grain are of distinctly minor importance, though short thick ears and ones with a rough indentation are undesirable.

Adapted Seed from our own Lands.

A mistaken idea, still prevalent amongst maize growers, is that fresh seed needs to be imported periodically from a different locality and that selection of seed should not be made from a crop which is poor on account of drought. The *reverse* is true in *both* instances. *The longer a variety is grown in a specific locality the better it becomes adapted to the conditions in that area*, and a change of seed might have exactly the opposite result to that intended, particularly if the seed is taken from a more favourable to a less favourable locality. Secondly, plants which produce reasonably good ears under droughty conditions, are clearly the best ones from which to select seed, especially in dry areas, provided, of course, that the seed is sufficiently well developed to be capable of good germination.

No special treatment of the seed is necessary beyond storing it, until needed, in a cool, well-ventilated place which is free from rodents. Should grain moth and weevil make their appearance, an inexpensive and practical method of preventing serious damage is to spread out the seed in direct sunlight on tarpaulins or a suitable floor for a day or two at a time as conditions demand.

Concentrates for Dairy Cows.—

[*Continued from page 430.*

In order to avoid wasting hay, it should either be fed in racks or against kraal walls, where trampling is prevented. If the hay is deposited somewhere in the middle of the camp, the cattle come from various directions and much wastage occurs through trampling.

While dry grass is available in the veld, the cows must be fed early in the morning and then driven into the veld in order to make the best possible use of the grazing. Maize can best be used by feeding it in balanced concentrat mixtures. The incorporation into the mixture of approximately 5 per cent. animal proteins, such as white fishmeal or bloodmeal, is essential.

Since many of the fatty concentrates, such as, e.g., groundnut oil-cake, are manufactured largely from imported raw products, it is essential to substitute other protein feeds for most of the oil cakes in concentrate mixtures.

(J. C. Bonsma, Animal-Husbandry Officer, Division of Animal and Crop Production.)

Inspection of Potato Fields for Seed Potatoes.

Dr. J. H. Hofmeyr, Lecturer in Crop Production, Glen College of Agriculture, O.F.S.

THE deterioration or degeneration of potatoes when tubers taken from the previous season's crop are used as seed for a number of years in succession, is well known to all potato growers.

Frequently, diseases and pests, among which eelworm infestation is a very common occurrence, also make it impossible for a grower to continue using his tubers as seed. It is, therefore, of the utmost importance that there should always be a supply of sound seed potatoes in order to ensure the production of good and profitable potato crops. In the case of potatoes the difficulty of maintaining adequate supplies to meet planting requirements is increased by the fact that, in comparison with other important agricultural crops, considerable quantities must be retained for seed—not to mention the fact that the keeping and storage qualities of the potato compare most unfavourably with those of the seed of other agricultural crops.

Under normal circumstances, no difficulty is experienced in maintaining the regular supply of good, healthy, productive seed potatoes since the necessary quantities can be imported whenever required. Owing to the dislocation caused by war conditions, however, matters have been complicated, with the result that the Department has had to adopt measures to ensure that potatoes which are eminently suitable for use as seed will be brought to the notice of the public. Not only is the formation of seed-potato grower's associations being encouraged in suitable localities with the assistance and under the guidance of the Department of Agriculture and Forestry, but the services of departmental professional officers are also being placed at the disposal of individual farmers who are desirous of producing potatoes but do not necessarily belong to a seedgrower's association.

The Government Potato-Inspection Scheme.

It is clear from enquiries received from time to time that, although the Government potato-inspection scheme has now been functioning for approximately a year, it is not yet fully understood by all. Indeed, some farmers who might otherwise make very good use of the scheme, still appear to be wholly ignorant of its existence. The following particulars can be furnished in regard to the inspection scheme for individual farmers:—

(1) The potatoes of farmers who do not belong to a seed-potato grower's association are inspected on request, if at all possible, but they cannot be certified: in such cases only *labels* are issued. One of these is attached to each bag, *provided*, of course, the potatoes are passed. On the label is stated that the potatoes are *Government inspected* and that they are recommended for use as seed.

(2) At least *two* inspections must be carried out, the first during the flowering stage and the second a month later. In certain circumstances, or if time permits, a *third* inspection is carried out soon after the potatoes have been lifted but before they have been sorted or bagged. No fees are payable by farmers for this service.

(3) Potato fields of less than five morgen per farmer are usually not inspected unless they are planted with imported seed.

(4) The regulations in connection with potato inspections are very strict in regard to the presence of degeneration diseases, ordinary potato diseases, eelworm infestation, stand, etc., and fields which are noticeably poor will not be passed. Farmers must, therefore, use their discretion before applying for inspection services.

(5) Applications for inspection services should be directed in good time to the Principal of the College of Agriculture serving the area concerned, mention being clearly made of the size of the potato field or fields. Application may also be directed to the nearest Extension officer or to the Director of Animal and Crop Production, Prudential House, Pretoria.

If a small group of farmers are desirous of forming a seed-potato grower's association, full detailed information is obtainable from the above-mentioned sources.

It appears that some farmers are under the impression that they may not sell potatoes for seed purposes unless the tubers have been inspected by an officer of the Department of Agriculture and Forestry. This is not the case since there are no restrictions on the sale of seed-potatoes. Naturally it is safer from the grower's point of view to buy seed-potatoes which have been inspected by an officer of the Department and recommended for use as seed.

Since the inspection service for individual growers is rended by the Department only as a temporary measure during present conditions, growers in areas suitable for seed-production are urged to form associations wherever possible, instead of producing individually.

The minimum number of members required for the formation of an association is seven and the rules and regulations applicable to all such associations in the country are obtainable from the nearest College of Agriculture or Extension officer serving the area or from the Director of Animal and Crop Production, Prudential House, Pretoria.

Protected Trees.

In view of the reckless destruction of certain types of trees in various districts of the north-western Cape Province, it was considered necessary to take steps for their protection. Provision was therefore made in the new Forest and Veld Conservation Act (Act No. 13 of 1941), authorizing the Governor-General to protect certain types of trees by proclamation.

The first step in this direction has already been taken by the promulgation of Proclamation No. 214 of 1941 by which the cutting of baobab trees on any land in the Union, not being Crown forest, is prohibited, as also the cutting of any of the following species of trees, viz., vaalbos, camel thorn, mimosa, withaak, swarthaak, karree and witstam, except for domestic use, in the districts of Barkly West, Hay, Herbert, Kimberley, Kuruman, Mafeking, Taungs and Vryburg.

According to Government Notice No. 1630 of 1941, any person wishing to cut down any of the above-mentioned trees should apply for permission to the Minister of Agriculture and Forestry, through the Director of Forestry, P.O. Box 334, Pretoria, from whom further particulars are obtainable.

Sucker-Lamb Production under Irrigation.

J. S. Starke, Officer in Charge, Losperfontein Experiment Station.

TO determine what breed and type of sucker lamb it would be most economical to produce under irrigation, a large-scale breed experiment was carried out at the Losperfontein experiment station during the years 1940 and 1941. For a few years prior to this, experiments had been conducted on fat-lamb production here, but not with the same diversity of breeds.

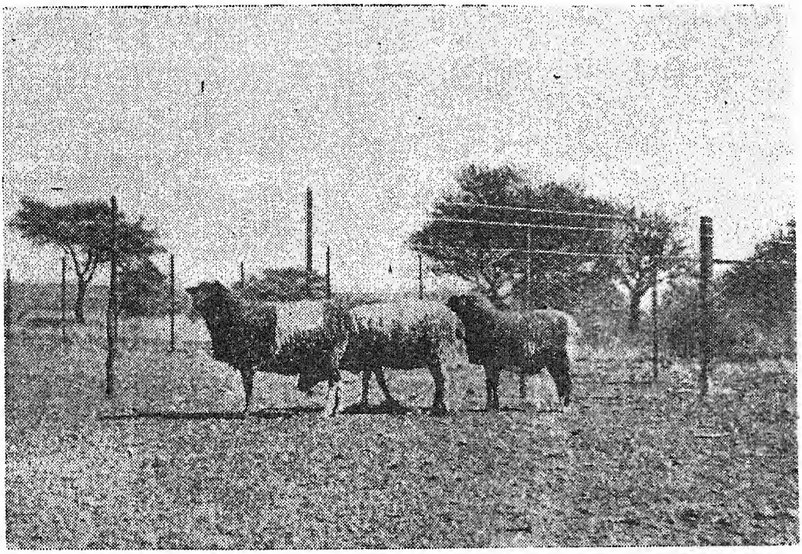


Fig. 1.—Dorset×Persian Ewes.

The Losperfontein Experiment Station, situated eight miles due west of Brits, falls under the Hartebeestpoort Irrigation Scheme. The general farming practice in this area is the production of tobacco in the summer and wheat in the winter. The production of vegetables or a mixed farming system, including some form of animal production, is negligible. It is considered that the introduction of the animal factor to form a mixed farming system under irrigation would have a stabilising effect. It is with this object in view that the experiments on the production of sucker-lambs —an intensive system of animal farming—were undertaken. After having determined that sucker lambs can be produced here, as has been shown by the earlier results, the next most important point is to determine the correct breed and type of lamb to be produced. Thereafter the economics of sucker-lamb production in comparison with cropping systems can be studied.

At present, owing to the prevalence of heartwater, the number of sheep in this area, which is on the fringe of the Bushveld, is very small. The summer temperatures are high, ranging from a mean daily minimum of 65° F. to a mean daily maximum of 90° F. The winters are mild although frosts occur.

Management of Sheep.

As this area is little known to the sheep farmer in the Union, a brief review of the management of the sheep flock here will not be out of place. Owing to ticks the sheep are not allowed to run on the veld. They are thus always grazing on crops grown on irrigated lands or fed hay in dry lot during rainy weather.

Lambing commences at the beginning of April, extending for 6 weeks till mid-May. This is followed after four weeks by a supplementary lambing of the skips in June. The suckling ewes and lambs are put on to winter-cereal grazing (mostly oats) on which they run until the end of October. During the summer months the dry and, later, pregnant ewes graze on summer cereals such as balala and sudan and summer legumes such as sunnhemp, cowpeas and velvet beans. The suckling lambs are castrated and docked when 7 to 14 days old. No supplementary feed is given. By the end of August practically all the lambs have been marketed.

Shearing is done early in September before the weather becomes too warm. Mating extends over the 6 weeks of November to mid-December, followed by a period of three weeks in January. The sheep are regularly dipped at weekly intervals in a "walk in" full immersion dip to control the ticks, especially the bontpoot (*Amblyomma hebraeum*). However, during the winter months of June, July and August, i.e., the three months before shearing, the sheep are put through the foot dip only. The wool, when shorn, does not appear to show the effect of the frequent dipping during the first nine months of its growth. From mid-March until lambing ceases the pregnant ewes have usually not been dipped.

Dosing regularly with single nodular worm remedy has kept the ewes free from internal worms. The sucker lambs, i.e., lambs marketed off their dams, are not dosed at all because they are marketed at such an early age; nor are they given a full immersion dip.

Breeding Plan of Investigation.

The Merino and the Black-head Persian have formed the basis of the breeding plan in this investigation. As it has been proved elsewhere, and confirmed by the results here, that these two breeds are unsuited to the production of sucker lambs, they were only used as foundation ewes for the production of a crossbred ewe, the mother-to-be of the sucker lamb.

The Merino was mated to rams of the white-woolled mutton breeds: Dorset Horn, Border Leicester and Romney Marsh, whilst the Black-Head Persian was mated to the Dorset Horn, Suffolk and Welsh Mountain. All female offspring were kept, whilst the hamels were marketed as lambs. These first-cross ewes were then mated, in 1940 and 1941, to the following mutton rams: Dorset Horn, Ryeland and Southdown, and the resulting progeny marketed as sucker lambs. Mating was done at nights when the groups of ewes were kraaled with their respective rams.

Results.

Only the results pertaining to the second-cross lambs will be considered now. Although numerous data on measurements of the live animal and on the carcass have been collected, only the more important aspects of a practical nature will be discussed here, viz., fertility of ewes and rams; birth weights and growth of suckling lambs, and carcass weights and grades.

TABLE I (A).—*Fertility of Ewes and Rams shown by Lambing Results of Crossbred* (1940 and 1941) *Ewes.*
(Including autumn and winter seasons.)

	Number of Ewes.	Pregnant.	Twins of Preg-nancies.	Lost of Preg-nancies.	Lambs Alive of Ewes Mated.
Mature Ewes.		Per Cent.	Per Cent.	Per Cent.	Per Cent.
Dorset x Persian............	65	95·4	12·9	6·5	101·5
Suffolk x Persian............	67	94·0	3·2	9·5	88·1
Dorset x Merino.............	165	78·2	22·5	16·2	83·6
Romney x Merino...........	84	72·6	9·8	9·8	72·6
Welsh Mt. x Persian.........	71	72·5	3·9	7·8	70·0
All Mature Ewes......	452	81·1	12·8	10·9	82·6
B. Leicester x Merino........	33	48·5	6·1	9·1	45·5
Oxford x Persian............	15	80·0	—	—	80·0
Maiden Ewes.					
Dorset x Persian............	80	86·3	1·4	5·8	82·5
Suffolk x Persian............	63	76·2	—	8·3	69·8
Dorset x Merino.............	13	53·8	14·3	14·3	53·8
Romney x Merino...........	70	60·0	2·4	4·8	58·6
Welsh Mt. x Persian.........	67	55·2	—	5·4	52·2
All Maiden Ewes......	293	69·3	1·5	6·4	65·9
B. Leicester x Merino........	17	47·1	—	—	47·1

A statistical analysis of these data allows one to draw the following conclusions, which will be evident on examining the table:—

(1) The mature ewes are more fertile, with a greater percentage of twins than the maiden ewes.

(2) Comparing the various breeds, the Dorset- and Suffolk-Persians are more fertile than the Dorset x Merino, Romney- Merino and Welsh Mountain x Persian ewes. The difference between the Dorset and Suffolk Persians is neither significant in the mature nor in the maiden ewes, although there appears to be a tendency for the Dorset-Persian maiden ewes to be more fertile than the Suffolk-Persians. The other three breeds did not differ significantly between themselves as regards fertility (i.e., percentage pregnancy).

(3) The Dorset x Merino crossbreds had significantly more twins than all the other crossbreds, including the Dorset x Persian. However, the high twinning capacity of the Dorset x Merino half-bred ewes is probably due to their Merino dams as well as to the Dorset sires, because the Merino ewes, from which they had been bred, also gave birth to a large number of twins.

(4) Although the Dorset-Merino ewes had the highest twinning percentage, they also had the highest percentage of lambs lost.

(5) The Dorset-Persian had the highest lambing percentage, i.e., the percentage lambs born alive of the ewes mated, viz., 101·5 per cent., followed by the Suffolk-Persian and Dorset-Merino, with the Romney-Merino and Welsh Mountain-Persian last.

(6) Included at the foot of the above table are the results of a few Border Leicester × Merino ewes, mated to Dorset Horn and Southdown sires, and still less Oxford × Persian ewes mated to the Southdown.

Owing to the small numbers, a statistical analysis of the data of these two breeds in comparison with the other half-bred ewes, mated to Dorset, Ryeland and Southdown sires, is not possible. It would seem, however, that the Oxford × Persian is somewhat less fertile than the Suffolk Persian. The Border Leicester × Merino ewes appear to be considerably less fertile than any of the other half-breds tested.

TABLE I (B).—*Seasonal Lambing Results of Crossbred Ewes.*

	Number.	Pregnant, Autum.	Pregnant, Winter.	Total.
Mature Ewes.		Per Cent.	Per Cent.	Per Cent.
Dorset x Persian...............	65	90·8	4·6	95·4
Suffolk x Persian...............	67	88·1	5·9	94·0
Dorset x Merino................	165	61·8	16·4	78·2
Romney x Merino..............	84	64·3	8·3	72·6
Welsh Mt. x Persian...........	71	62·7	9·8	72·5
All Mature Ewes.........	452	70·5	10·6	81·1
B. Leicester x Merino..........	33	39·4	9·1	48·5
Maiden Ewes.				
Dorset x Persian...............	80	76·3	10·0	86·3
Suffolk x Persian...............	63	52·4	23·8	76·2
Dorset x Merino................	13	46·2	7·6	53·8
Romney x Merino..............	70	31·4	28·6	60·0
Welsh Mt. x Persian...........	67	35·8	19·4	55·2
All Maiden Ewes.........	293	49·8	19·5	69·3
B. Leicester x Merino..........	17	35·3	11·8	47·1

From the above table one is able to draw the following conclusions, confirmed by statistical analysis:—

(1) A greater percentage of mature ewes lambed in the autumn than maiden ewes, i.e., they conceived more readily in the spring.

(2) The Dorset Horn × Persian maiden ewes take the ram better than all the other maiden crossbreds during the early mating in November and December.

TABLE II.—*Lambing Results from Different Sires* (1940 and 1941).

Sire.	Number of Ewes Mated.	Pregnant.	Twins of Pregnancies.	Lost of Pregnancies.	Lambs Alive of Ewes Mated.
		Per Cent.	Per Cent.	Per Cent.	Per Cent.
Dorset Horn................	244	69·3	5·3	12·4	64·3
Southdown..................	240	62·9	11·9	5·3	67·1
Ryeland....................	241	55·6	7·5	9·0	54·8
All Sires.............	725	62·6	8·1	9·0	62·1

The above table includes only the autumn lambing results of the crossbred ewes just considered, as other rams were used to serve the skip ewes to lamb down in the winter. A statistical analysis of the data, summarised in Table II, enables one to conclude that the ewes mated to the Dorset Horn rams were significantly more pregnant

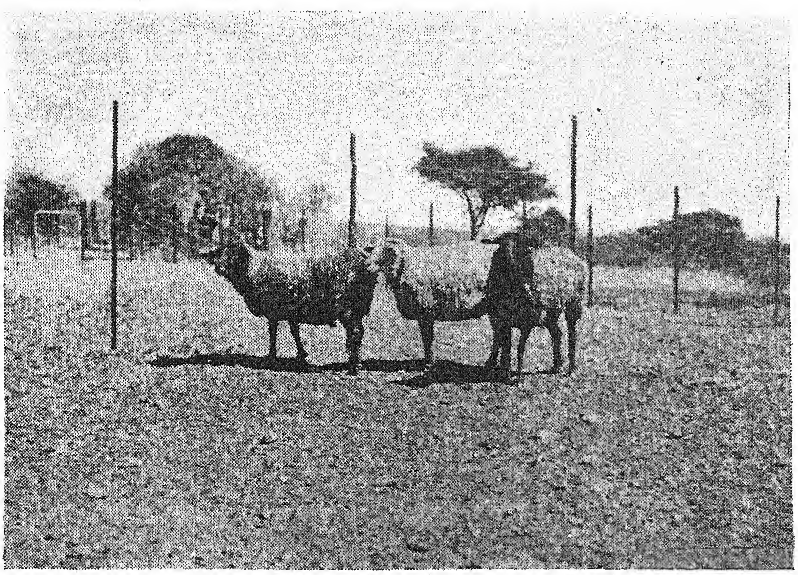


Fig. 2.—Suffolk×Persian Ewes.

than those mated to the Ryeland. The Southdown sire gave a percentage pregnancy in between the Dorset and Ryeland.

However, the Southdown sired significantly more twins than the Dorset, and also there were significantly less lamb losses, with the result that the Southdown even had a higher lambing percentage (i.e., percentage lambs born alive) than the Dorset Horn and Ryeland.

Growth of Suckling Lambs.

As mentioned previously, the ewes are placed on oat grazing as soon as they have lambed. When about a week old the baby lambs already start nibbling at the pasture. The wet ewes are always given the best grazing, whilst dry stock come after them to clear

off the pasturage. The ewes and lambs remain on one paddock for about 7-14 days. When the grazing extends beyond this period the ewes and lambs do not feed so well. In sucker-lamb production under irrigation it is desirable that the lambs should never receive any setback in their growth. The docking of the tails and castration of the ram lambs at the age of 7-14 days have an effect on the growth rate during the subsequent fortnight. This will be investigated at a later date. However, as can be seen in the following tables the growth of the lambs during the 1940 and 1941 seasons has been remarkable. In a comparison of the various types only the single lambs reared by their own mothers have been considered.

The lambs were slaughtered as soon as possible after they had passed the live weight of 61 lb. In Table III the average birth weight, final live weight, the average number of days to reach this weight and the average daily gain for the male and female lambs born in the autumn of the two years 1940 and 1941 are given. The difference between the two years was slight, the lambs growing slightly faster in 1941 than in 1940.

TABLE III.—*Average Growth Data of Different Types of Second-Cross Lambs* (1940 and 1941).

Dam.	Sire.	Number.	Birth Weight.	Final Weight.	Age.	Daily Gain.
			lb.	lb.	Days.	lb.
Dorset x Persian....	Dorset...........	35	9·6	63·7	84·0	0·66
	Ryeland.........	31	9·9	63·5	89·0	0·61
	Southdown.......	28	9·5	63·2	93·0	0·59
	TOTAL......	94	9·6	63·5	88·5	0·620
Suffolk x Persian....	Dorset...........	28	10·0	64·3	88·0	0·62
	Ryeland.........	21	10·0	62·8	96·0	0·56
	Southdown.......	26	9·3	62·7	95·0	0·57
	TOTAL......	75	9·8	63·4	92·9	0·586
Dorset x Merino.....	Dorset...........	23	9·1	63·4	95·0	0·58
	Ryeland.........	19	9·8	62·7	97·0	0·57
	Southdown.......	16	8·9	62·9	102·0	0·54
	TOTAL......	58	9·3	63·1	97·4	0·566
Romney x Merino...	Dorset...........	20	9·3	62·9	100·0	0·56
	Ryeland.........	17	9·5	62·5	109·0	0·51
	Southdown.......	24	8·5	62·3	112·0	0·49
	TOTAL......	61	9·0	62·6	107·0	0·516
Welsh Mt. x Persian.	Dorset...........	18	8·7	63·1	102·0	0·55
	Ryeland.........	12	9·4	62·6	100·0	0·54
	Southdown.......	14	8·4	62·4	110·0	0·49
	TOTAL......	44	8·8	62·7	104·1	0·532
B. Leicester x Merino	Dorset...........	7	8·9	63·4	99·0	0·56
	Southdown.......	4	10·7	62·9	89·0	0·60
	TOTAL......	11	9·5	63·2	95·4	0·572
Oxford x Persian....	Southdown.......	11	9·6	63·0	97·0	0·56

From Table III supported by a statistical analysis, it can be seen that the lambs from the Dorset × Persian mothers grew significantly faster than all other types of lambs; they reached the live weight of 63 lb. in 88 days, i.e., not quite 3 months. The lambs from Suffolk × Persian ewes also grew faster than lambs reared by Welsh Mountain × Persian ewes. The Dorset × Merino ewes reared their lambs at a faster rate than the Romney × Merino ewes. The Dorset- and Suffolk-Persian ewes gave the heaviest lambs at birth,

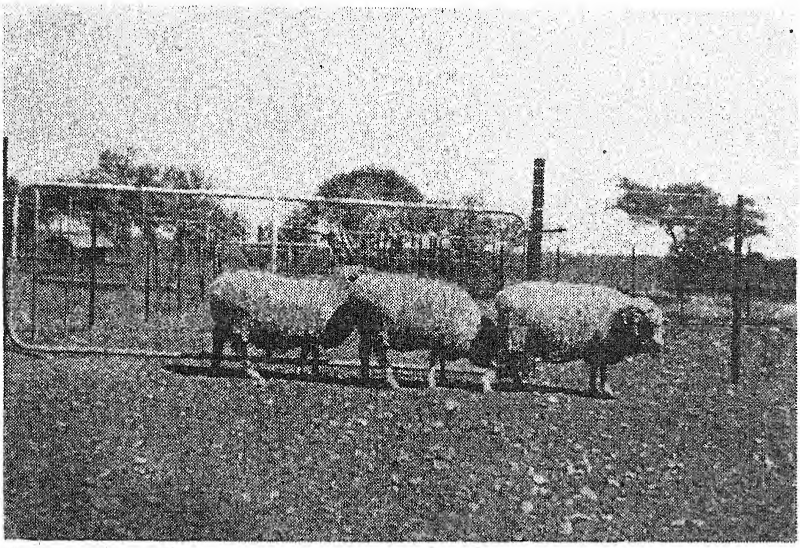


Fig. 3.—Dorset × Merino Ewes.

followed by the Dorset- and Romney-Merino ewes, whilst the Welsh Mountain-Persian ewes had the lightest lambs at birth.

Although data from only a few lambs of the Border Leicester × Merino, and Oxford × Persian types are available, the lambs from these breeds appear to be similar in growth to the lambs from the Dorset × Merino and Suffolk × Persian ewes respectively.

The best average growth made by any one of the lamb types tested was that of the 35 Dorset × Dorset-Persian lambs, which reached the live weight of 63·7 lb. in 84 days.

In Table IV the above data have been regrouped according to the sire of the lambs.

TABLE IV.—*Growth Rate of Second-Cross Lambs from Different Sires.*

Sire.	Number of Lambs.	Birth Weight.	Final Weight.	Age.	Daily Gain.
		lb.	lb.	Days.	lb.
Dorset Horn................	124	9·4	63·6	92·1	0·605
Ryeland....................	100	9·8	63·0	96·7	0·567
Southdown..................	108	9·0	62·7	101·4	0·540
TOTAL............	332	9·4	63·1	96·5	0·572

The male lambs (143) were heavier at birth than the female (189), viz., 9·7 lb. compared with 9·2 lb., and grew considerably faster, viz., 63 lb. in 92 days compared with 63 lb. in 100 days. The 15 Dorset × Dorset-Persian male lambs reached the live weight of 63 lb. in the remarkably short average time of 78 days.

From Table IV it will be seen that the Ryeland gave the heaviest single lambs at birth, viz., 9·8 lb., followed by the Dorset. The Southdown, although last, had an average birth weight of 9·0 lb. The final weights are more or less constant at 63 lb. However, the Dorset Horn lambs took a shorter time (92 days) to reach this weight than the Ryeland and Southdown lambs. When comparing the daily rate of gain the Dorset Horn had a significantly faster growth than either the Ryeland or Southdown. The difference between the latter was not found to be statistically significant, i.e., the difference may be due to chance and not to the breed.

Carcase Data.

The data given in Table V are grouped according to the mother ewe and according to the sire of the sucker lamb.

TABLE V.—*Carcase Data.*

	Number of Lambs.	Warm Carcase Weight.	Dressing.	Conformation.	Finish.	Grade.		
						A.	B.	C.
		lb.	Per Cent.	0–10	0–10	Per Cent.	Per Cent.	Per Cent.
Breed of Mother Ewe.								
Dorset x Persian............	78	34·7	54·5	7·3	7·8	55	44	1
Suffolk x Persian............	66	34·4	54·3	7·2	7·9	62	36	2
Welsh Mt. x Persian..........	43	33·5	53·3	7·3	7·8	56	44	—
Dorset x Merino.............	65	31·4	49·8	6·7	6·8	29	56	15
Romney x Merino............	60	30·8	49·2	6·7	6·7	28	62	10
TOTAL............	312	33·0	52·3	7·0	7·4	46	48	6
B. Leicester x Merino.........	12	30·7	48·8	6·4	6·6	—	92	8
Breed of Sire.								
Dorset......................	117	32·9	51·5	6·6	6·9	21	67	12
Ryeland.....................	94	33·3	53·0	7·2	7·4	50	46	4
Southdown..................	101	33·0	52·6	7·4	7·9	71	29	—
TOTAL............	312	33·0	52·3	7·0	7·4	46	48	6

The first portion of the table reveals that the Persian crossbred ewes produced lambs with a higher dressing percentage, a better conformation and better finish, than the Merino crossbred ewes. This is confirmed in the grading where there were more A's in relation to B's amongst the lambs from Persian crosses than amongst those from Merino crosses. There was no significant difference between lambs from the Dorset-, Suffolk- and Welsh Mountain-Persian ewes nor between those reared by the Dorset- and Romney-Merino ewes.

Coming to the second portion of the table it is at once evident that the lambs sired by the Southdown had better finish and conformation than those sired by the Ryeland, which again were much better than the lambs from the Dorset sire. This is very clearly

illustrated in the grading figures. There was no difference in dressing percentage between the lambs sired by these three breeds of rams.

Conclusions.

(1) The Persian crossbred ewe is a better producer of sucker lambs than the Merino crossbred. The latter again is responsible for a greater income from wool. The relative aspects of wool and lamb production will be considered after another year's results have been obtained.

(2) Of the Persian crossbred ewes the Dorset × Persian, closely followed by the Suffolk × Persian, proved far superior to the Welsh Mountain × Persian ewe for sucker lamb production because of a higher fertility and faster growth of lamb.

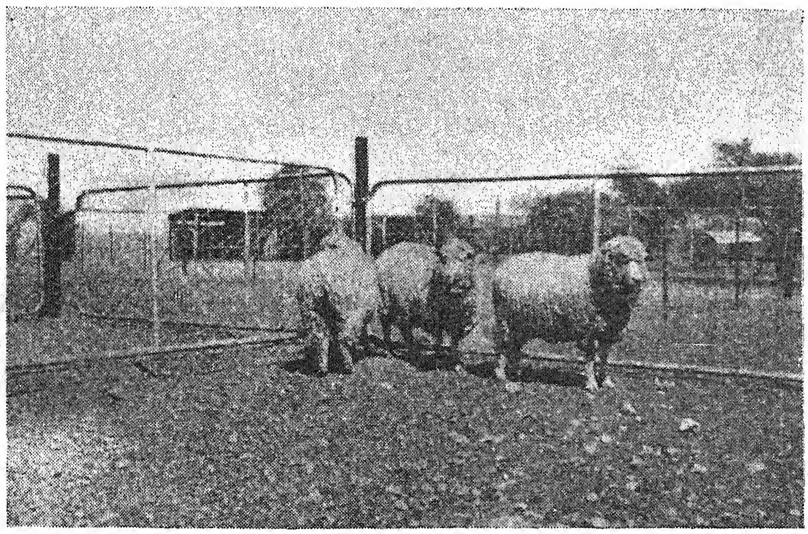


Fig. 4.—Romney × Merino Ewes.

(3 Of the Merino crossbreds the Dorset-Merino proved slightly superior to the Romney- and Border Leicester-Merino crossbreds, also because of greater fertility and a faster growing lamb.

(4) The Ryeland in comparison with the Dorset proved to be less fertile, with its lambs growing not quite so fast but yielding a better carcase. However, the Southdown sire produced a still better carcase than the Ryeland, although its lambs did not grow so fast, in addition, the Southdown is responsible for more twins, with a resultant higher lambing percentage than the Ryeland.

Combining all these aspects enable one to come to the conclusion that the Ryeland is neither superior to the Southdown nor the Dorset Horn as a sire for sucker lamb production.

Cereal Smut Diseases.

AT the present time when the feeding of man and beast is a national concern of primary importance we need to pay special attention to avoidable losses of food products. Smut diseases of cereals are liable to cause both a diminution in yield and a depreciation in quality of food products which can in most cases be largely eliminated by using simple precautionary methods.

There are three main types of cereal smuts. One type attacks the young plant immediately after germination and before it has reached ground level. A second type infects the plant at the flowering stage and lies dormant in what appears to be perfectly healthy seed. The third type is only able to attack the fairly mature plant in portions where growing tissues are present.

Control Measures.

The first type of smut includes the majority of those of special interest to the farmer, such as stinking and flag smuts of wheat, oat smuts, covered smut of barley, and kaffir-corn smut, to mention some of the commoner examples. In these cases seed sterilisation before sowing is effective as the infective material occurs on the outside of the seed. Sometimes, as in flag smut of wheat, crop-rotation may also need to be practised to rid diseased soil of infection. Substances used for seed disinfection are copper sulphate (bluestone), formalin, copper carbonate dust, as well as organic mercurial preparations such as Ceresan, Semesan, etc. If seed disinfection is thoroughly carried out, it is very effective in reducing the amount of smut to very small proportions.

In the second type of smut, which fortunately is not very destructive and includes such diseases as the loose smuts of wheat and barley, the seed germ is infected. Seed sterilisation by means of chemical substances is thus not effective as these cannot penetrate into the living tissues of the seed, without killing them as well as the fungus. Steeping in hot water, kept at a definite temperature, is the only method which can be used in these cases. In practice the method is only employed for seed to be used for a seed-plot, the seed from which will be sown on a field.

The third type of smut, where growing tissues of the fairly mature plant are attacked, includes the common boil smut of the mealie. In this instance the soil becomes infected with the causative organism and the most effective treatment is crop rotation.

Further details in regard to recommended treatments may be obtained on application to any of the agricultural colleges or to the Division of Botany and Plant Pathology, Pretoria.

(Geo. A. Gill, Botanist, Grootfontein College of Agriculture, Middelburg, C.P.)

Plough Now for the Next Maize Crop.

Dr. A. R. Saunders, Deputy Director of Production.

ON several occasions recently the Department of Agriculture and Forestry has stressed the necessity of utilizing the whole maize crop to the best advantage by cutting and stooking at least part of the crop and ensiling frost damaged immature maize.

The late rains which have fallen constitute a boon of incalculable value provided farmers make the best use of this golden opportunity. *Preparations for next season's crop should commence now*, for seldom have conditions for winter-ploughing been so favourable as at the present time. Not only is the soil, generally, moist enough, but draught animals are still in good condition, with the result that ploughing operations can be performed expeditiously and at a lower cost than when the ground is dry and the going hard.

Do Not Break Virgin Soil.

In encouraging farmers to produce more maize and other summer crops next season, the Department does *not* desire that the cultivated area should be extended by bringing virgin soil under cultivation and thereby destroying much needed and valuable natural grazing, *but rather that every effort should be made to increase the yield per morgen.* In this regard the advantages of winter ploughing are too well-known to require further emphasis, but it is to the methods by which the practice can be made possible that it is desired to draw attention.

Clear Your Lands.

Winter-ploughing pre-supposes the clearing of the land of the previous season's maize stalks. The common method is to graze off the stalks after the ears have been harvested, but this often takes so long that by the time the lands are cleared, the soil is not in a fit state to plough properly. I am therefore going to tell you how to avoid this delay, and even though the methods which I am going to suggest may not always make it possible to plough all the land in winter, there is no reason whatever why at least some of the soil should not be turned over before it becomes too hard to handle.

In the first place, on land where the maize has been cut for silage or stooked, ploughing can commence forthwith, and it is gratifying to know that this is already being done in several instances. Secondly, where the ears have already been harvested but the stalks are still standing, clearing operations need not be further delayed. To make a start, the stalks may be cut off on a portion of the land and carted into stacks to form a reserve of, admittedly poor, but nevertheless valuable, fodder supplies.

Should shortage of labour or the pressure of harvesting operations prevent large-scale cutting the stalks could be cleared advantageously by concentrating the grazing animals on a limited area at a time and moving them progressively to new ungrazed parts of the land. This

can be done by temporary fencing, by herding, or a combination of both.

For such temporary fencing you can use old rusted wire which is unfit for boundary fences and of which there are usually fair quantities available on most farms. Herding presents no difficulties except that it requires additional labour and that the animals have to be removed at night. However, the labour need not be expensive as native piccanins can be employed.

Whatever the method or combination of methods employed, the object should be to start ploughing as early in the winter as possible. This has the further advantage that since the work is spread over a longer period of time, the farmer requires fewer draught animals and implements.

Importance of Winter-ploughing.

The main purpose of winter-ploughing is not so much to conserve soil moisture *as to ensure that the crop shall be planted in time the next season.* Many losses from planting too late are due *not to the shortness of the growing season but to delay* in getting the seed into the ground, especially in seasons when the rains are late in arriving. Ploughing is the slowest and most costly of all cultural operations, and because of the general lack of rainfall during the spring or early summer months, the more that can be done during the winter the better.

But the time factor is not the only consideration. Equally important is the fact that, if the ground is already ploughed when the first summer rains fall, there is less chance of water being lost through run-off, and, above all, unless the rains are unusually late, there is time enough to destroy one or two crops of weed seedlings before the new crops are planted. *This process of pre-cleaning is one of the cheapest and most effective methods for reducing the cost of weed control and obtaining good yields.* Moreover, combined with winter ploughing, it is a simple and practical means of combating cut worms and other insect pests.

Many growers object to winter-ploughing on the score that a second ploughing is necessary before planting, and that total ploughing costs are therefore nearly doubled. *Now please note.*—Experiments have shown that, except in rare instances, this contention has very little basis in fact, provided that the work is *done well* in the first instance and surface cultivation prior to planting commences when the weeds are still small enough to be handled with an ordinary disc harrow or fine cultivator.

Burning Veld out of Season.

K. E. W. Penzhorn, Extension Officer, Division of Animal and Crop Production.

FROM the earliest times, farmers in South Africa have burnt the veld in order to obtain fresh, green grazing for their live stock, and it was considered essential to burn veld for sheep, especially ewes with lambs at foot.

Much has already been written and many discussions have taken place on the merits and demerits of veld-burning. The conclusion arrived at was that veld-burning is a necessary evil in certain areas, or in other words, where farming can be carried on without resorting to the burning of veld, this is the proper course. In some areas, however, the burning of veld is sometimes essential, and consequently remains a practice which cannot be completely eliminated.

Lovers of the natural grass-veld and champions of the fight against soil erosion must, however, have felt deeply disturbed by the numerous veld fires which, during the past winter and early summer, destroyed thousands of morgen of veld in various parts of the Transvaal and Natal. These fires occurred after a very severe drought and before the spring rains had set in.

Damage to the veld and soil caused by such untimely burning is enormous. It is distressing to think of the masses of valuable top-soil which were washed away from these bare, burnt areas and the numerous new sluits which were formed there, after the first heavy rains.

Two-fold Damage.

The damage caused by burning veld late in winter or in the spring, before good spring rains have set in, is two-fold:—

In the first instance the grazing is damaged and weakened, and consequently deteriorates. Those veld grasses which are known as good grasses are nearly without exception perennials such as red grass, buffalo grass, finger grass, etc. During autumn the perennial grasses build up a reserve of food in their roots (in the same way as deciduous trees). This enables the grass to grow during spring until its factory, viz., its leaves, has developed to such an extent as to be able to manufacture food for the plant. Usually the grass begins to grow during spring immediately after a rain or, if the soil is moist, with the advent of warmer weather. By burning the veld, however, growth can be forced, even if the soil is dry. This artificial growth is made possible by the presence of the food reserves in the roots. It is clear therefore that, unless rain soon follows, continued grazing of this new growth will exhaust the food reserves, with the result that many of the plants will die. Inferior pioneer grasses take their place and in this way the quality of the veld deteriorates. In the second place, *soil erosion is encouraged.* If the veld is burnt at a time when the soil is very dry, not a blade of grass will escape the fire. Even the valuable bits of manure scattered over the veld are burnt. The surface of the soil is therefore exposed to the desiccating effect of sun and wind and the eroding action of storm-water. The first spring rains usually come in the form of heavy downpours. There is nothing to stem the free

flow of run-off over the denuded surface, and consequently tons of top-soil are carried away to the sea. In hollows and valleys the erosive force of concentrations of storm water is great enough to form dongas and sluits.

The damage caused by veld fires in northern Natal and adjacent portions of the Transvaal during the course of the past year must be enormous.

The advantages ascribed to veld-burning during the spring and before the first rains have fallen are often illusory. This is evident especially in regard to the provision of better and more abundant pasturage. What actually does happen, is that live stock which have once grazed on the young green grass on burnt veld, refuse to take dry fodder of poorer quality; and if this new green growth fails, the animals lose condition much more rapidly than others which have been kept exclusively on old grazing.

When Veld-burning is Permissible.

The question naturally arises as to whether veld should be burnt at all. Unfortunately it is sometimes necessary to burn veld in order to remove a super-abundance of old worthless grass. With good pasture management, however, veld-burning will not be necessary more often than once every second or even every third year in the sour-veld or semi-sour-veld areas. The following general principles may be applied in these areas, but not in the sweet-veld, i.e., the bush-veld or thorn veld:—

(1) Burning during the early autumn (February-April), followed by heavy grazing, is extremely injurious to the veld and must be avoided. Moreover, there is no excuse for this practice since there are numerous well-known crops and grasses which can be cultivated to produce sufficient green pasturage for this period.

(2) Veld-burning in the spring is permissible only if the abundance of coarse, unpalatable old grass is likely to bring about a deterioration of the grazing during the coming season. Under no circumstances must closely cropped grass be burnt. It is therefore unnecessary to burn the veld every year.

If burning must be done during spring, it should be carried out after sufficient rain has fallen to encourage new growth. If the veld is burnt 2 to 4 days after rain has fallen, the soil will still be moist and only the leaves of the grass will be burnt, the crowns remaining undamaged. Animal droppings on the veld will also remain unburnt. Since there will be sufficient moisture in the soil, the individual grass plants will not deteriorate and the grazing as a whole will therefore not suffer much. This method is sometimes called " singeing ".

It may be pointed out that those who advocate veld-burning sometimes refer to the strips of veld between the fences along railway lines in support of their arguments. The Railway Administration will burn this grass at any time of the year and yet there never is any noticeable deterioration in the quality of the grass. The reason is quite apparent. Burning followed by heavy grazing is injurious, while burning without any grazing will usually show no ill-effects.

Control of Worms in Sheep.

Dr. H. O. Mönnig, Onderstepoort.

AN article devoted to the treatment of sheep for worms may perhaps prove dangerous since, on the whole, too much attention is already being paid to remedies, at the expense of the very much more important preventive measures such as good feeding, lambing at the correct times, rotational grazing, etc. Seventy-five per cent of the worm menace could be eliminated by the application of these measures, and remedies need be employed only for what remains of the pest. Moreover, remedies should always be used for the purpose of removing the source of infection in the animal, rather than merely for saving the animal's life.

To treat the sheep regularly and maintain them in good health is therefore a much better policy than to resort to a remedy once the animals are severely infected and on the point of dying and have already seriously infested the veld.

Treatment against liverfluke should be applied only when the exigency arises. No effective remedy is known against lungworms. These two kinds of worms are most effectively controlled by measures other than dosing.

Type of Worm and Its Control.

The most troublesome worms, however, are those occurring in the abomasum and intestines of the sheep, viz.:—

Abomasum:

(1) Wire Worm. (2) Brown Stomach Worm.

Small Intestine:

(3) Bankrupt Worm. (4) Hookworm. (5) Tapeworm.

Large Intestine:

(6) Nodular Worm.

The following vermicides are effective against the worms indicated by numbers:—

Nodular Worm Remedy (N.W.R.): 1, 5, 6.
Blue Vitriol-Nicotine Mixture (B-N Mixture): 1, 3, 5.
Tetrachlorethylene: 1, 2, 3, 4, 5.

Nodular Worm Remedy is supplied by the Division of Veterinary Services, together with full particulars. The B-N Mixture is prepared as follows (do not prepare in a metal bucket or tin):—

1 oz. (by weight) blue vitriol.
1 oz. (liquid) (C=30 c.c.) 40 per cent. nicotine tobacco extract, 3 pints of water. The mixture may be kept in bottles for long periods and the following doses administered: For lambs of 1-3 months: ¾ oz.; for lambs of 4-6 months: 1 oz.; for lambs of 7-12 months: 1½ oz.; and for sheep more than 12 months: 2 oz.

Tetrachlorethylene is obtainable from the Division of Veterinary Services under the name of " Tetram "—an emulsion diluted with water, which is easy to administer (not obtainable during the war), or under the name of " Tetrol "—a mixture containing an equal percentage of oil. Great care must be exercised in administering the latter. This mixture is also obtainable from some private firms under various other names.

Calendar for the Sheep Farmer.

In the accompanying calendar hints are given on how to use the various remedies. The three types of worms which are most troublesome are killed by N.W.R., and experience has shown that serious trouble can always be prevented by regular dosing with this remedy, strictly according to instructions, while the veld is green. Since the young worms remain in the nodules for three months or even longer and are therefore inaccessible to any remedy during this period, one or two treatments are not sufficient to rid a sheep of worms. During winter, when the infestation on the veld disappears and dosing is discontinued since it is effective only in sheep running on green grazing, numerous young worms emerge from the nodules and mature in the large intestine. With the advent of hot weather and Spring rains these worms reinfest the veld with their eggs. Consequently, the remedy should be administered as soon as green grass appears, irrespective of the condition of the animals and merely as a measure for ridding them of worms. Regular treatment should be continued until the veld becomes dry, and after a year or 18 months the nodular worm will have disappeared. Farmers expecting rapid results will never succeed in exterminating the nodular worm.

There are, however, a few types of worms which are not killed by the Nodular Worm Remedy. The Brown Stomach Worm is particularly troublesome in the coastal and winter-rainfall areas. The Bankrupt Worm is especially injurious to Persian and bastard sheep and Merino lambs. Hookworms occur in many localities; one type, which is fatal to sheep, is very prevalent in the sandveld areas of the Western Transvaal, Western Free State, Northern Cape and the whole of Bechuanaland and South West Africa, while another type which is also harmful is distributed throughout the grassveld areas of the Union, particularly on damp pastures.

Where no hookworms occur, the B-N Mixture may be used: otherwise Tetrachlorethylene must be administered as recommended in the calendar, i.e., a few doses in between the regular treatments with N.W.R. while the veld is green, and an additional dose about once a month when the veld is dry. The latter dose will kill off the worms which escaped the action of the N.W.R.

It is clear that the continuous use of a single remedy which does not exterminate all kinds of worms, is unsatisfactory, and that the replacement of N.W.R. which has been used for a long time, by Tetrol, will give very good results. It is however, not advisable to discontinue completely the use of the former in favour of the latter.

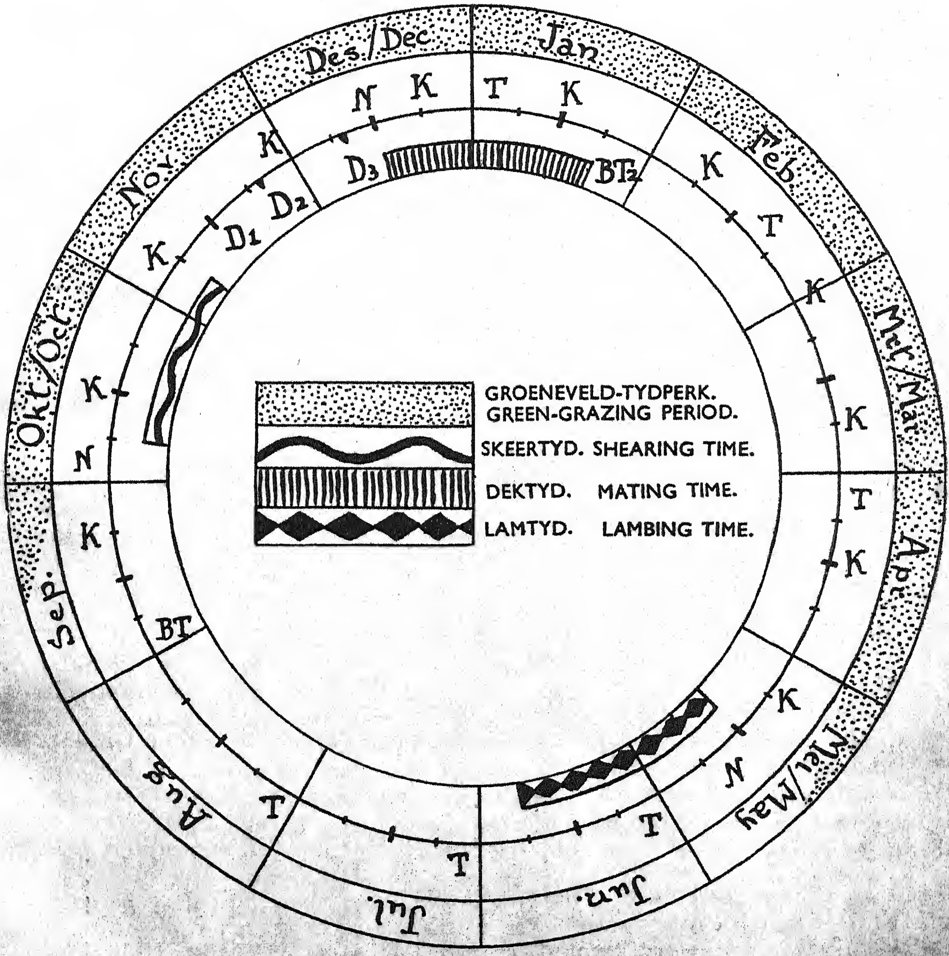
There is another reason why a change of remedies is necessary. The large quantities of blood present in the abomasum and small intestine of the sheep as a result of bleeding caused by wireworms and hookworms contain iron which neutralizes the action of the

N.W.R. Where large numbers of wireworms and hookworms are present, the N.W.R. is therefore less effective and another remedy is necessary at intervals to reduce their numbers.

Too many worm remedies, on the other hand, are not beneficial to the sheep, and farmers must use their discretion in the application of these measures. If the worm infestation has considerably decreased N.W.R. and B-N Mixture or Tetrol may, for example, be administered in turn every three weeks or even every month, and treatment may be discontinued during the dry season.

The Treatment of Sheep.

Sheep should be well-fed at all times and in cases of anaemia 2 lb. green vitriol per week for every 300 sheep, should be incor-



Calendar.

N.W.R.—Treatment with Nodular Worm Remedy.
T.—Treatment with Tetrol (or B-N Mixture).
N.—Treatment for Nasal Worm where necessary.
Bt.—Inoculation against Blue Tongue and, where the disease is severe, a second treatment is indicated by Bt. 2.
D.—Dip for keds three times at intervals of 10 to 14 days.

porated in the daily lick mixture. Where brak is absent, 300 sheep consume approximately 33 lb. salt and 66 lb. bonemeal per week.

Questions are frequently asked in connection with the vitriol solution which is in some cases administered prior to dosing. This solution need not be swallowed but is given with a view to stimulating the nerves of the mouth, which need only be moistened; consequently a small quantity is adequate. In the case of lambs and sheep in good condition, these nerves are easily stimulated, but the older the sheep and the poorer their condition, the more difficult it is to stimulate the nerves. A stronger solution is therefore required in such cases. The 10 per cent. solution is therefore recommended for all sheep. The B-N Mixture contains blue vitriol, but it may be advisable when dosing sheep in very poor condition, to give the animals a teaspoonful of 10 per cent. vitriol water before administering the remedy in order to ensure that the remedy will reach the abomasum.

It is not necessary to withhold food or water from the sheep before treatment. In fact, in the case of N.W.R. it is a dangerous practice. It is advisable to withhold water from sheep for two hours after treatment with the B-N Mixture, and lambs should have no milk in their stomachs when the remedy is administered, and they should therefore be kept away from the ewes from 4 hours before to 2 hours after treatment; they may, however, be allowed to graze on shrub veld. Tetrol sometimes causes bloating in sheep, but this can be avoided by dosing in the morning after the sheep have been kept in the kraal overnight. Tetrol has the same effect as chloroform and may sometimes induce dizziness in young or weak sheep. The best practice is to keep them in a cool, open spot with plenty of fresh air, where they can sleep off the effect of the remedy.

Teff Seed.

The attention of farmers, who usually sow teff, is drawn to the necessity for making, as far as possible, adequate provision for their own seed requirements. Nobody can predict the state of affairs next season, and a shortage of teff seed will have disastrous consequences, especially if, on account of drought or for some other reason, a second sowing may become necessary.

As a result of the damage done by army worms, the crop of the past season was in many cases not suitable for seed, and, in addition, the high prices obtained for teff hay have resulted in a disinclination on the part of farmers to thresh their teff in order to obtain their own seed. *But every farmer is requested, in his own interest as well as in the interest of the country, to give urgent consideration to the question of seed and to take immediate steps to ensure that the production of teff will continue uninterrupted next season.*

Where there is still hay on farms, even though it may be some of last year's crop, it would be worth while to thresh it in order to obtain the necessary amount of seed. If some of the seed obtained in this manner should be immature, this should be taken into consideration and larger quantities threshed.

On farms where the hay is baled, a considerable amount of seed is lost, and even if only this seed is collected and stored, it would already be a step in the right direction.

(Controller of Food Supplies.)

Nicotine for Aphids.

Dr. Bernard Smit, Senior Entomologist, Pretoria.

ALMOST every crop that is grown in South Africa is subject to the attack of aphids, which are often called plant lice, blight, or green flies.

There are many different species of these, but they all suck the sap from the plants and reduce their vitality and the subsequent crop. In some cases the aphids also transmit serious virus diseases, as for instance, the leaf-roll disease of potatoes. By sucking out the sap they cause plants such as cabbages and tobacco to be stunted and finally to turn yellow and die. In the case of tobacco also the honey-dew produced on the leaves makes these unsuitable for curing. When young growing shoots are attacked, as on citrus trees, the shoots wither and many young fruits drop off just after setting. Infested peach leaves curl up and become deformed, and many garden plants just wilt and shrivel up. The growing shoots and buds of roses are often attacked and destroyed.

Aphids are remarkable for their rapid rate of reproduction and for their sudden appearance in enormous numbers. In this way they often take the farmer or gardener completely by surprise and do a great deal of damage before he has noticed their presence. This is particularly the case in the spring, so that all who grow field crops and fruit should be on the lookout for these aphids and should control them as soon as possible at that time of the year.

Fortunately, these insects are soft-bodied and can easily be killed with a contact insecticide. One of the most effective contact insecticides for this purpose is nicotine, and this can be used in various forms.

Tobacco Extract.

An extract or concoction of tobacco can be made by simply soaking tobacco leaves in water for 24 hours or by pouring boiling water over them and then letting them cool. The extract should never be boiled, for nicotine is volatile and would be driven off with the steam. Powdered leaves and stems are used, or sometimes tobacco sweepings from warehouses. The difficulty with this method is to obtain a strong enough extract of uniform strength, particularly with our South African smoking tobaccos, which contain on an average only about 2 per cent. of nicotine.

In order to kill aphids, the spray should contain not less than 0·05 per cent. of actual nicotine, that is, one part in two thousand parts of spray. To get this strength, about 100 lb. of sweepings is needed to make 100 gallons of spray. The soaking or leaching method has, however, been used successfully on farms where there is a surplus of waste tobacco. Also some tobacco factories in South Africa in the process of manufacturing their smoking mixtures have produced a solution of nicotine in water as a by-product which was used successfully against aphids by people in the neighbourhood.

The extract should be used at once because it will not keep. In a few days it begins to ferment and then loses its strength. The

large volume required also makes it impractical to transport it any great distance. It is difficult to standardize this extract without careful laboratory analysis. The dark heavy types of tobacco give more nicotine than the light types, and with a heavy smoking tobacco in America it was found that 28 lb. per 100 gallons of water would give the required strength for aphid control. Much depends on the locality in which the tobacco is grown.

After the powdered tobacco leaves and stems have been soaked for 24 hours the mixture should be strained carefully to remove all solid matter and prevent spray pumps and nozzles from being clogged.

Practically all the tobacco extract that has been used in South Africa to control aphids has been imported, and it seems very strange that this should be the case seeing that this is a tobacco-growing country. The reasons for this are various and rather difficult to understand, but on the whole they have been mainly of an economic nature. As the demand for nicotine increases, however, and as it becomes more difficult to obtain it from overseas, the possibility of establishing a nicotine-extract industry in South Africa becomes greater. The price of nicotine is now about twice as much as it was before the war. With this in view, the Department of Agriculture and Forestry is continuing its investigations in connection with the production and use of this valuable product.

If our low-grade tobacco, which contains about 2 per cent. of nicotine, can be produced for about 1d. per pound and the methods of concentrating the extract can be improved it seems likely that a profitable industry will develop. On the other hand there is another type of tobacco which gives a much higher yield of nicotine than does the ordinary smoking tobacco, and experiments in growing this are being carried out at Rustenburg.

This tobacco is called *Nicotiana rustica* or the *Rustica* type of tobacco. The plants are smaller than the ordinary tobacco plants, but their dried leaves contain up to 12 per cent. of nicotine. The plants seem to grow well in South Africa, but they would have to be grown especially for nicotine production, and whether this is an economic proposition is still an open question.

Wetters and Spreaders.

Because aphids are sucking insects and because we therefore use a contact insecticide like nicotine to kill them, the nicotine must thoroughly spread over and wet the insects.

Moreover, aphids are more or less covered with wax. This is sometimes in the form of fine particles, which cause the insects to appear as if they were covered with grey powder, as in the case of the cabbage aphid. It is sometimes in the form of cottony fibres, as on the woolly apple aphid. In every case this wax tends to protect the insect by making it more difficult to wet with the contact spray. The spray for aphids must, therefore, always have a wetter added to it. Various substances have been tried, including oil sprays, and these are often used when scale insects are to be controlled at the same time as the aphids—but for aphids alone there is nothing better than soap. The best form of soap is soft soap, which mixes easily with water. Ordinary yellow soap can be used, but in this case it is necessary to cut it up and dissolve it by boiling it in a little water

before adding it to the nicotine solution. Experiments were carried out to ascertain the best quantity of soap to use, and it was found that 2 lb. to 100 gallons of spray mixture gave very good results. If the water used is hard, more soap must be added to neutralize the salts, but very hard water should be avoided.

Commercial Tobacco Extracts.

There are various brands of tobacco extract on the market and these usually contain from 7 to 8 per cent. of nicotine or 40 per cent. of nicotine.

To give 0·05 per cent. of nicotine in the spray mixture, the weaker extracts are therefore usually diluted at the rate of one part by volume to 100 to 140 parts of water before use.

The stronger 40 per cent. extract is diluted at the rate of one part to 800 parts, but this may vary from 500 to 1,000 according to the species of aphid to be controlled.

An even stronger extract has been used in some countries, and the author experimented some years ago with one that contained 98 per cent. of nicotine. This is almost pure nicotine and is deadly in every respect. When diluted to give the same percentage of nicotine in the spray mixture—that is, by mixing one part with 1,959 parts of water—its toxicity is about the same as the other forms.

One of the commonest forms of nicotine on the market in South Africa is nicotine sulphate, which is a chemical compound made by treating the nicotine alkaloid with sulphuric acid. This also contains 40 per cent. of nicotine, and because it is a dark-coloured liquid, is often called " Black leaf forty ". Its toxicity is about the same as that of the 40 per cent. tobacco extract.

In deciding which form of nicotine to use the cost should be worked out in terms of the actual nicotine bought in the extract. Recently the nicotine sulphate has been selling at about eight shillings per pound, but although this may seem high it is still an economic proposition because of the great dilution at which this 40 per cent. compound is used. In the 7 per cent. extract the actual nicotine at present prices costs about three times as much as when bought in the 40 per cent. nicotine sulphate.

Spraying.

The object in spraying for aphids is to wet the insects, and for this a fine driving spray is necessary. As high a pressure as possible should be used, and the spray should form a fine spreading mist. Disc nozzles are most suitable for this work, and they should be bent at an angle to facilitate spraying under leaves and around stems. For gardens, a knapsack spray pump is preferred, as it can be used by one man, and plenty of free movement is possible with it. It is important in spraying to keep the nozzle moving. For citrus groves and orchards a power pump is required.

Nicotine Dust.

In certain circumstances it is not convenient to use a spray outfit filled with heavy liquid in an orchard, and dusting with a dry powder is easier and quicker.

Nicotine dusts have been developed for use against aphids and are often very effective. Such a dust should contain not less than 2 per cent. by weight of nicotine, and should be finely ground so as to blow over the aphids like a cloud of smoke. Nicotine dusts deteriorate in storage, so that they should be used as soon after manufacture as possible.

A good dust can easily be made on the farm as follows:—

> Use good quick lime, and slake it carefully until it forms a fine white powder. Make a sieve from fine brass gauze, such as is used in garages to strain petrol. A good grade having 100 mesh to the inch should be used, and can be obtained at about 7s. 6d. per yard. The sifted lime will be fine and soft. Weigh out 50 lb. of this, and put it in an old butter churn or a clean oil-drum with a tight-fitting lid. Add a few round river stones for better mixing, and then add 2 pints of nicotine sulphate. Close the churn or drum tightly, and roll it around for ten minutes. By this time the nicotine will be thoroughly mixed with the lime.

The powder should be separated from the river stones and used as soon as possible. There is not enough liquid in the nicotine sulphate to damp the powder, and it will still form a fine cloud when blown out of a dusting machine. The bellows type of dusters which give a definite puff with fairly high pressure are best for the spot dusting of aphids.

The weaker tobacco extracts cannot be used for making nicotine dusts, because they contain too much water. All nicotine dusts should be kept in air-tight tins as much as possible. They are light and easy to use, and they are very effective, killing the aphids in a few minutes. Dusting is particularly effective on low-growing plants like vegetables, although in many places it is also used on a large scale on citrus and other fruit trees.

Nursery Quarantines.

The following nursery quarantines were in force on 1 June 1942:—

(1) Kildare Nurseries, Pietermaritzburg, on apples (part), for pernicious and white peach scales.

(2) Subkleve's Nurseries, Johannesburg, on deciduous fruit trees (part), for pernicious scale.

(3) Page's Nurseries, Franschhoek, on citrus (all), for red scale.

(4) F. P. Long, Clumber, on citrus (whole), for red scale.

(5) E. O. Hiscock, Clumber, on citrus (whole), for red scale.

(6) Montrose Nurseries (Pty.), Ltd., P.O. White River, on citrus (whole), for red scale.

The Breeding and Use of Draught Horses in South Africa.

II. The Draught-Horse Type.

Dr. P. J v. d. H. Schreuder, Senior Professional Officer (Horses), Division of Animal and Crop Production.

FORMERLY all breeds of horses were classified into four main types, namely, the light, the heavy, the coach, and the pony breeds. Ponies are often smaller horses of the light breeds measuring 14 hands and under. The coach or carriage breeds have almost disappeared in competition with mechanical means of conveyance and transportation, such as the motor car, the tram and the railways.

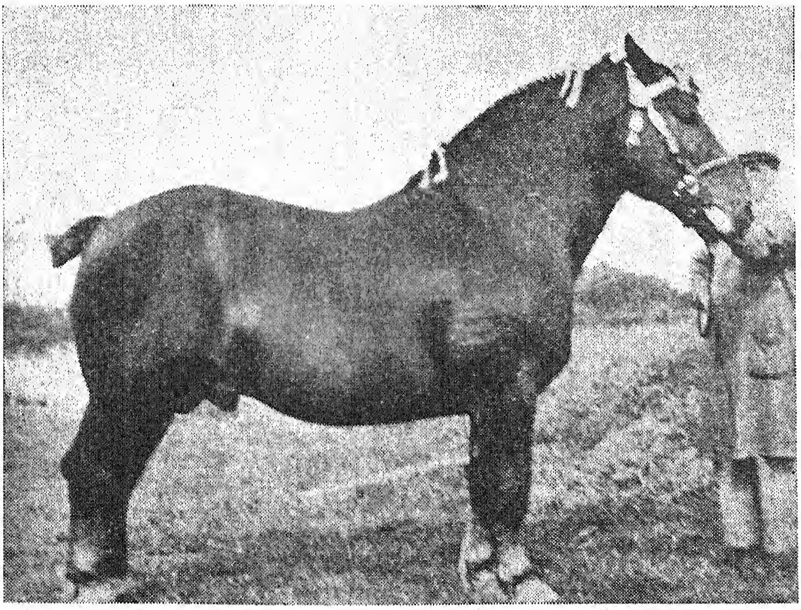


Fig. 1.—A champion Suffolk Stallion.
[*Photo by permission.*

In countries where a breed or breeds of draught horses is well established, a fine classification of different classes of draught horses exists. The word " work horse " is frequently used for light horses which do general odd jobs, while for heavy hauling a heavier type is in demand. The influence of climate, soil and other environmental factors, maintenance and even breeding operations have resulted in the development of horses strikingly different in type, character and purpose. Especially is this the case in the United States of America where there are large numbers of different breeds of light horses and where a good deal of breed mixture takes place. In a lesser degree similar conditions are met with in South Africa. Our horse stock is still mainly of a light type, but the use of draught-horse

sires is to an increasing extent producing different classes of heavier horses. These include heavy harness horses, even heavier saddle horses and so on until we come to the heavy draught animals produced in the high-grade draught-horse class. The average South African farmer is very fond of working his team at a trot when doing cartage or haulage work with wagons or carts. In time, therefore, even here a classification will be made in types of heavy draught horses.

Apart from mere breed characteristics, it is the type of animal that suits diffirent utility factors which is being propagated. Type more often than breed is the important feature in the production of draught or work horses. Such draught horses may vary in weight from 1,300 to 2,000 lb. and stand from 15·2 to 17·2 hands. Whatever the height and weight may be, the primary essential attributes of good wearing qualities in feet, legs, health and stamina are always stressed.

For present-day use in almost all countries only the light and the heavy breeds are receiving the attention of breeders and the users of horse power.

Before entering into a brief discussion of the draught breeds it is considered expedient and necessary to give the student and breeder a clear understanding of the essential points of these two types of horses. The following score card must be the beginner's guide in forming a correct estimate and appreciation of the features and attributes of a " good " horse in each type.

Since the draught horse is used mainly for tractive power, it is imperative that an intimate knowledge should be acquired, not only of the breed characteristics, but also of the mechanics of this living machine.

Scale of Points.

The following scale of points will prove of great assistance. (Compare the photographs of the two champions in their respective types.)

Scale of Points.	Heavy Standard.	Light Standard.
A. GENERAL APPEARANCE: Draught 35; Driving 43—		
Age: Estimated.........yrs., actual.........yrs..........	—	—
Height: Estimated.........hands, actual.........hands....	—	8
Weight: Estimated.........lb., actual.........lb.........	8	—
Form: For draught: Low, massive, symmetrical; for driving: High, lithe, indicative of extreme activity....	6	4
Quality: Bone, flat; tendons, clean; skin and hair, fine....	8	10
Colour: According to breed..........................	1	2
Action: Step, smooth, quick, long; trot, rapid, straight, regular..	4	10
Attitude: Members vertical..........................	5	5
Temperament: Lively, pleasant.......................	3	4
B. HEAD AND NECK: Draught 5; Driving 5—		
Head: Lean; length, two-fifths height of withers; width of forehead, more than one-third length of head; depth of head, one-half its length. For driving—smaller, carried higher and more horizontal..........................	1	1
Muzzle: Fine; nostrils, large; lips, thin; teeth, sound..	1	1
Eyes: Full, bright and intelligent......................	1	1
Ears: Short, clean, fine, directed forward, wide apart....	1	1
Neck: Pyramidal, muscled; throat, clean, fine; windpipe, large. Depth of insertion at shoulder equals length of underline 2 to 4 inches shorter than head. For draught—neck shorter, thicker, more horizontal..................	1	1

Scale of Points.	Heavy Standard	Light Standard
C. FOREQUARTERS: Draught 20; Driving 19—		
Shoulders: Long, extending into back; point of shoulders to point of withers, equals length of head. For draught—shorter and more upright	3	2
Arms: Relative short, 12 to 13 inches. For draught—more horizontal	1	1
Forearms: Vertical, long, 14 to 15 inches, wide. For draught—shorter, more heavily muscled	2	2
Knees: Clean cut, wide, deep; for driving, 3 inches, for draught, 4 inches, strongly supported	3	3
Canons: Vertical, short, 9 to 10 inches, lean, wide; tendons well detached. For driving, longer	2	2
Fetlocks: Wide, thick, clean, free from puffiness	1	1
Pasterns: Angle 45 degrees, fetlock to ground 7 to 8 inches. For driving—long, sloping; for draught—short, more upright	2	2
Feet: Round, even size; horn, dark coloured, dense; sole, concave; bars, strong; frog, large, elastic; heel, vertical, one-half length of toe	6	6
D. BODY: Draught 10; Driving 8—		
Chest in general: High, long. For draught—wide, half height of horse; for driving—higher	3	2
Withers: Clearly defined for driving	0	1
Breast: For driving—high, projecting; for draught—broad and muscular	1	1
Ribs: Long, round, curvature, wide apart	2	1
Back: Straight, short, muscular; shoulders, to haunch equals length of head. For driving—longer	2	1
Loin: Wide, short, thick, strongly joined to hips	1	1
Underline: Long; for draught, flank low	1	1
E. HINDQUARTERS: Draught 30; Driving 25—		
Hips: Level, wide in proportion to other parts; for draught, smooth; for driving, more prominent	1	1
Croup: Wide, long, muscular, 2 to 4 inches shorter than head. For driving—horizontal; for draught—shorter, more oblique	4	3
Tail: Set and carried high, long, full, fine	1	1
Thighs: For driving—long, 15 to 16 inches, upright; stifle, deviated outward. For draught—shorter, more horizontal, muscular	3	3
Buttocks: Heavily muscled, well descended	2	1
Gaskins: For driving—long, 14 to 15 inches, upright. For draught—shorter, more horizontal, heavily muscled	3	2
Hocks: Clean cut, large, straight, deep; for driving, 3 inches; for draught, 4 inches. For draught, wider	6	4
Canons: 11 to 12 inches long, otherwise as above	2	2
Fetlocks: As above	1	1
Pasterns: As above; angle, 60 degrees	2	2
Feet: Compared with above, more oval, more concave; heels, higher, more separated; walls, more vertical	5	5
TOTAL	100	100

Value of Score Card.

The above scale of points for light and heavy types of horses draws attention to the different body points and features in a logical manner. It stresses the comparative value of points not only in each type, but also in the individual—splints, curbs, thick shoulders, etc., which are minor blemishes in a heavy horse doing his work at a walk, become serious defects in the faster moving horse, the remount, pacer or racer; but again one makes sure that the sum-total of the

draught-horse's limbs are dependable and of high quality, since its wearing and working qualities depend very largely on the character of its legs and feet. One must always be guided by the saying "No foot, no horse".

The score card helps the student to see every part of the horse and not merely the animal—a close study of parts will give a true estimate of the whole.

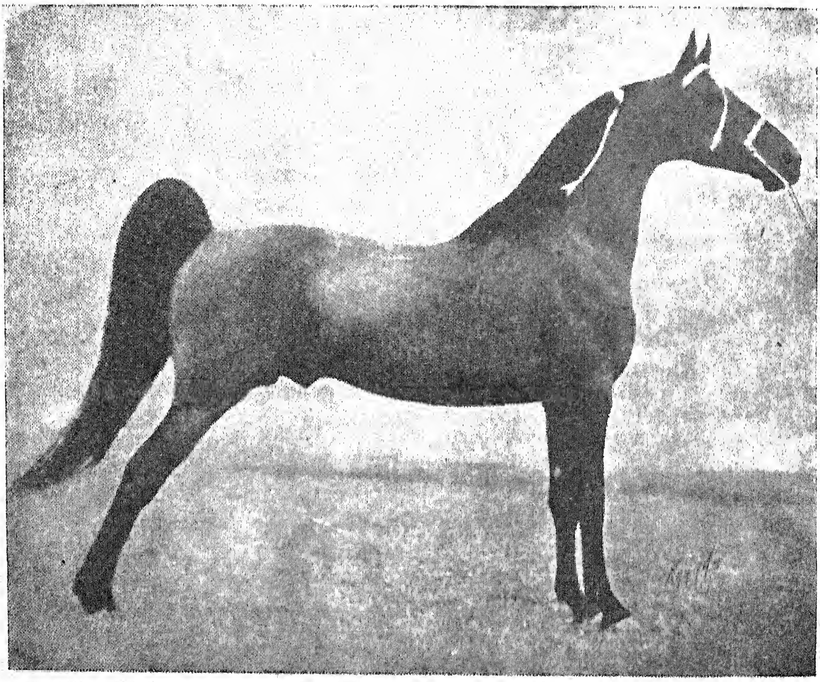


Fig. 2.—A champion Saddler Stallion (Compare with Suffolk).
[*Photo by permission.*

The successful breeder and user of horses must have an "eye" or develop an "eye" for what constitutes a good horse. A mental picture as well as an intelligent estimate of the "perfect" horse must be clearly defined in one's brain. All judging is compared with a standard for each type. One scores each point on a percentage basis, every part of an animal being compared with the standard; the value assigned may be 100 per cent. or a cut of 10-20 per cent. may be made.

A new attitude towards the horse is gradually being developed throughout this country wherever balanced, intensive farming propositions are in practice. The sadle and carriage and pair are giving way to the plodding team of heavies—farm power that originates entirely from the farm from the point of both maintenance d replacements—a national development of selfhelp that will have reaching effects towards a better system of farming. The recent lopment and use of farm power in the world's greatest crop-ıcing countries have established the fact that in combination machines the horse's economic usefulness is more secure than

Caramelisation of Food Products.

Wm. Edwyn Isaac, Government Low Temperature Research Laboratory, Cape Town.

(The caramelisation on storage at high temperatures of mixtures of citric or tartaric acid and different sugars, with special reference to lemonade and orangeade powders.)

THE present war has, among other things, brought to the fore problems of maintenance of food and food products under tropical and semi-tropical conditions. In this connection the storage of synthetic lemonade and orangeade powders was investigated, as well as the use of these powders in emergency as media for supplying ascorbic acid (vitamin C). The results obtained have a value not only in relation to lemonade and orangeade powders, but also as indicating one of the mechanisms of browning of other food products. Browning is a frequent cause of food spoilage under high temperature conditions.

Storage Tests on Lemonade and Orangeade Powders.

A number of different lemonade and orangeade powders were stored for eight weeks in dark rooms with a rapid air circulation and with relative humidities of 25 and 15 per cent. at 98° F. and 110° F. respectively. These powders contained a high proportion of acid to sugar, the bulk of the sugar being added when the lemonade or orangeade is prepared for drinking.

At the high storage temperatures used, the orangeade and lemonade powders tested were liable, in different degrees, to caramelise. By caramelisation is meant the development of a progressively darker brown colour with the formation ultimately of a hard, glassy, amorphous mass or (depending on the water-content) of a dark thick treacle-like liquid.

There was no caramelisation if either citric acid was replaced by tartaric acid or glucose substituted for sucrose. The severity of caramelisation was increased by increasing the proportion of citric acid to sugar. This was more evident in sealed containers (glass bottles and cans) than in cardboard boxes owing, in the latter case, to evaporation under the conditions of these tests. Most of the powders stored in cardboard boxes showed no caramelisation, and even when the proportion of citric acid was highest, there was but limited caramelisation. When sufficient water was added caramelisation occurred in cardboard boxes.

A number of experiments were carried out designed to elucidate the mechanism of the caramelisation described above. Dextro- (ordinary) tartaric acid lacks water of crystallisation, but citric acid contains water of crystallisation which was shown to be liberated at the storage temperatures used. If this liberated moisture was prevented from escaping (powders packed in bottles and cans) it initiated hydrolysis of sucrose into glucose and fructose. Caramelisation of fructose then took place with a further liberation of water. Under the storage conditions used, a mixture of citric acid and fructose or of a sugar liberating fructose on hydrolysis (sucrose,

raffinose) showed caramelisation. Mixtures of citric acid with xylose, glucose, galactose, maltose or lactose did not caramelise.

Orangeade and lemonade powders which are meant to be stored under tropical conditions should contain a large bulk of sugar, i.e., the sugar which would be added ultimately should be incorporated initially in making the powder. Alternatively, glucose may be used instead of sucrose or tartaric may be used instead of citric acid, or both of these substitutions may be made. Tartaric acid gives a less pleasant drink than citric acid and less of it is needed to give the same degree of sharpness. Also glucose is not as sweet as sucrose, but with the type of powder investigated the bulk of the sugar is added when making the lemonade or orangeade for drinking.

The Prevention of Cracked Eggs on the Farm

WHEN an egg becomes cracked its selling value is lowered considerably. The poultry farmer can minimize this loss on the farm by giving attention to a few of the causes.

First of all, the nest should be attended to. To prevent overcrowding, one nest should be provided for every five birds. There are two types of nests that are satisfactory. The one is a small nest with just sufficient room for the comfort of one bird. The other is a long undivided nest box, 18 inches deep, with an entrance at each end. In this type of nest about 12 square inches of nesting space is allowed for every five birds. It is best to arrange the nests so that they are well shaded from the light. Apart from the fact that the birds prefer these nests to open and well-lighted nests, there is less overcrowding and nervousness on the part of the laying birds, consequently two of the chief causes of eggs becoming cracked and soiled are eliminated.

The nesting material should be renewed frequently, as it soon becomes dirty and clogged, especially during wet weather. The eggs should be collected two to three times a day, depending on the production of the birds, otherwise the nests may become so filled with eggs that many get cracked and soiled. Often the mistake is made to collect eggs in a receptacle too large and deep, resulting in some of the eggs at the bottom becoming cracked by the weight of those on top. Any pliable receptacle or one that dents in and out with handling, is unsuitable; one that is shallow, firm, and rigid should be used.

Packing of Eggs.

When cleaning and packing the eggs, careful handling should be exercised as eggs often become cracked when too many are held together in one hand, and when large eggs are pressed into fillers which are too small for them.

The correct way to pack eggs is to stand them on their small ends in fillers in which they do not fit too tightly. A sufficient layer of wood-wool, straw or grass must be placed in the bottom of the box to act as a shock absorber. Another layer should be placed on the top layer so that when the lid of the box is closed the whole pack of eggs is pressed firmly together.

Lastly, in conveying the eggs from the farm on a badly sprung vehicle or over a rough road, bags loosely filled with straw form a first-class shock absorber for the boxes of eggs to stand on, and will help greatly to minimize loss from cracked eggs.

(E. F. Lombard, Professional Poultry Officer, East London.)

The Sandveld Grain-Worm.

THE sandveld grain-worm (*Apophylia duvivieri*) is an insect which causes considerable damage to crops on sandy soil in the western Cape Province, especially in the Hopefield, Piquetberg and Clanwilliam districts.

The grain-worm is the larva of a small shiny green or purplish blue beetle which lays its eggs singly in spring on matricaria plants and on grasses. With the arrival of the first winter rains when the new grain crops are sown, the eggs hatch and the small worm which emerges, attacks the young, germinating plants by cutting the stems just below the surface of the soil.

Many fertile patches occur in the sandy soil of the above-mentioned three districts where matricaria plants grow luxuriantly during spring. Many eggs are laid on these plants with the result that the crops sown on such soil are entirely destroyed by the grain-worms which emerge. Since these patches of soil are the most fertile and consequently would have produced the highest yields, the loss suffered is all the more serious.

Control Measures.

In order to control the grain-worm, lands intended for the following year's crops should be fallowed at any time from the middle of August to the middle of September, that is, before the adult insects make their appearance. During this period the insect is in the soft pupal stage and is easily killed by the turning over of the soil. Ploughing also destroys all matricaria plants on which the insects can lay more eggs. The beetles emerge from the middle of September to the beginning of October by which time the soil should have been broken up if this treatment is to prove effective.

It is also advisable at the time of breaking up the soil to ensure that the ground along the sides of the lands are cleaned for matricaria since large numbers of eggs are laid on the plants growing there. If these plants are left they become dry in summer, and are blown across the lands with the result that the eggs of the insects are distributed far and wide. All infested plants should be burnt. This procedure would considerably reduce the propagation of the insect.

Lands sown immediately after the first winter rains are less susceptible to attack by grain-worms than are lands sown at a later stage, because once the plants have become established, the worms are incapable of causing serious damage. Although grain sown early will be impeded to a much greater extent by weeds than that sown later in the season, the weeds cannot affect the crop so seriously as the grain-worm will.

Another preventive measure against grain-worm infestation is to roll lands with a heavy roller as soon as the worms commence their attacks on the plants. The worms find it difficult to live in the compacted soil and come to the surface, where they are unable to destroy the plant. In addition, when on the surface, they are exposed to various factors making for their destruction. This method is not completely effective, but may be applied as an additional measure. Furthermore rolling serves a double purpose, since the compacting of the surface soil reduces evaporation. Frequently it also retards the growth of the crop and, consequently, prevents excessive leaf-growth which generally results in a poor grain yield.

(O. S. Heyns, Extension Officer, Piquetberg.)

The Farm Home.

(A Section devoted mainly to the interests of Farm Women.)

Vitamins in the Diet: Vitamin A.

Miss S. Naudé, Dietician, Food Control Organization.

WE hear so much about vitamins, we all know that new ones are being discovered continually, and we have a vague idea of their function, but nobody tells us what they really are. Research workers tell us that they are chemicals, present in very small amounts in certain foods, but the housewife would rather know how they look, or taste, or smell, so that she can know what vitamins we have in the different foods.

The Colour.

Vitamin A is easily remembered because it has a colour. When you see a salad bowl of grated carrots, or a dish of cooked pumpkin; when you admire the turning leaves of autumn or the delicate yellow of rich milk, you are looking at the forerunner of vitamin A. This yellow colouring matter, which is called carotene, is taken up by the system when such foods are eaten and changed into vitamin A. Carotene has the same beneficial properties as vitamin A, but to a lesser degree. It is present in many plants: in yellow, orange and orange-red vegetables, in fruits of all sorts, and in the green leaves, stalks and growing seeds. It is the orange-yellow colouring underneath the fading green that accounts for the leaves turning to such brilliant colours in the autumn. When carotene is taken up by an animal it is transformed into vitamin A. Most of the animal's supply is stored in the liver and the remainder mostly in the kidneys and the fatty tissues. A large amount accumulates in the eyes which need a steady supply in order to see well.

Importance of Vitamin A.

One of the first symptoms of lack of vitamin A in the diet is a decreased ability to adapt the eyes to seeing in a dim light. If your work demands that you use your eyes a lot at night, or if you often drive in the dark, you must have an abundance of vitamin A in your diet. If you were to avoid vitamin A to a marked extent you would soon have badly inflamed eyes and eventually become blind.

If you want to be gloriously healthy, you will see to it that you always have a good store of vitamin A in your body. It keeps your skin soft and smooth, your membranes resistant to infection, your teeth and gums in good condition; it gives you a sense of being alive to your fingertips. If you make the best use of edible plants containing carotene, when they are in season, you will store enough vitamin A in your body to tide you over seasons when such foods are scarce. The winter is such a time, and lack of vitamin A at this

time is evidenced by the greater incidence of colds, which, in many cases, are due to weakened membranes which are unable to defend themselves against the attacks of cold germs.

Vitamin A in Animal Products.

You can also benefit from the carotene which has been eaten by animals. This carotene has already been converted into vitamin A and stored in the tissues of the animals. Thus, always eat the fat meat with the lean, eat liver frequently, and kidney now and then. Egg yolk and milk contain vitamin A when the hen or cow has been fed carotene-rich fodder. The depth of colour of the cream and yolk is some indication of the vitamin content. Butter is rich in vitamin A as this vitamin is soluble in fats. Always remember that vitamin A from animals is more active and more easily taken up in your own system than carotene from plants, although we include both under the general term—vitamin A.

Vegetables and Fruits rich in Vitamin A.

Among the highly coloured vegetables which are rich in carotene, we find carrots, pumpkin, squash, tomatoes, ripe sed sweet peppers, sweet potatoes, yellow mealies as distinct from white, red kidney beans and the yellow soybeans. Among the green leaves and vegetables which provide generous supplies of carotene are parsley, spinach, beet leaves, the green outside leaves of lettuce, celery and cabbage; also green sweet peppers, string beans and peas. Among the fruits, apricots and peaches with yellow flesh head the lot. Others are bananas, avocados, cherries, apples, dates, figs, oranges and pineapples.

Vitamin A is not destroyed by cooking and, usualy, it is not seriously damaged during the drying of fruits, while sulphuring of the fruit seems to protect the vitamin A. Ordinary canning processes also have little adverse effect on the vitamin A content of a food. On the whole, we can be sure that we will store enough vitamin A on a mixed diet including an abundance of vegetables and fruits. A good rule would be: At least one yellow or green vegetable daily and at least one serving of butter. Fish-liver oils are the most concentrated source of vitamin A and can be resorted to when there is a possibility of a shortage of this vitamin in everyday foods.

Selected Recipes.

The following are a few recipes in which foods rich in vit. A are used:—
C=Cupful, T=Tablespoonful, t=teaspoonful.

LIVER AND VEGETABLE PIE.

½ lb. liver.	1 t. salt.
3 large onions fully chopped.	½ t. cayenne pepper.
2 c. dried cooked potatoes.	1 t. honey or sugar.
1 cup cut up tomatoes.	1½ T. standard meal.
3 T. chopped sweet green pepper.	2 T. butter.
1 T. chopped celery.	1 c. water.
1 t. chopped celery leaves.	Scone dough for crust.

Brown the onions in the butter. Dip the liver into boiling water for five minutes, remove the outer membrane and cut into ¾ inch cubes. Pan-broil the liver with the onions. Add the meal, stir well and then add the water to make a gravy. Cook until the gravy is thickened. Mix all the ingredients in a baking dish, cover with the scone dough. Bake until the crust has browned and the vegetables are tender in a medium oven of 375° F. about half an hour.

Scone Dough.

2 c. standard meal.
4 t. baking powder.
½ t. salt.
3 T. butter.
¾ c. milk.

Mix the dry ingredients lightly. Cut the butter into the meal with two knives. Sprinkle the milk over the mixture and cut in with a knife. Roll out lightly and use.

Salad.

2 carrots.
1 sweet green pepper.
½ an avocado pear.
1 t. salt.
A few grains cayenne pepper.
A few springs of parsley.
A small head of lettuce.
A small bunch of water cress.
Juice of a lemon.

Clean all the vegetables carefully. Cut the carrots into matchlike strips. Remove the seeds from the pepper and chop the flesh finely. Cut the avocado pear into thin slices. Chop the parsley finely. Break the lettuce and the watercress into small pieces. Mix all the ingredients lightly and serve very cold.

N.B.—Celery and tomatoes may sometimes be substituted for some of the ingredients.

Carrot Sweets.

4 c. minced carrots, raw.
1 c. orange juice.
½ c. lemon juice.
Sugar.

Cook the carrots in the fruit juices until soft. To every cupful of pulp add ½ c. sugar. Cook stiring continually, until the mixture leaves the sides of the pan. Pour into greased moulds. Allow to dry well then cut into shapes. Roll in sugar and store in tins or jars.

Kidney Bean and Beef Casserole.

½ lb. kidney beans.
1 t. salt.
¼ t. paprika pepper.
1 sweet green pepper.
1 finely chopped onion.
1 t. lemon juice.
2 T. butter.
½ lb. chopped beef with dried suet.

Soak the beans in water to cover, overnight. Add salt and simmer slowly until just tender. Brown the union in the butter, then add the meat and stir and cook until browned. Chop half the sweet pepper. (After removing the seeds) and cut the other half in rings. Mix all the ingredients in a baking dish, laying the pepper rings over the top as a garnish. Cover and bake for half an hour in a moderate oven.

Sweet Potato in Orange Shells.

8 oranges.
4 c. cooked sweet potatoes.
2 T. melted butter.
½ t. salt.

Cut a slice from the top of each orange and remove the pulp with a sharp knife and a spoon. Save the juice. Whip the sweet potatoes with the salt, butter and enough orange juice to moisten. Fill the orange shells with the mixture. Brown in moderate oven until heated through.

Canned Mealie Soufflé.

2 c. canned yellow mealies.
2 T. standard meal.
2 T. butter.
1 c. hot milk.
1 t. salt.
Wellbeaten yolks of 2 eggs.
Lightly beaten whites of 2 eggs.
2 T. chopped sweet green pepper.
1 T. chopped parsley.

Melt the butter, stir in the meat to make a smooth paste and add tre milk. Cook slowly until thick and smooth, stirring as needed. Add the mealies pepper and parsley then the egg yolks. Lastly fold in the stiffly beaten egg whites. Pour into a greased baking dish and place in a pan of hot water in a medium oven. Bake until well set—about 45 minutes.

Crops and Markets

A Statistical and Economic Review of South African Agriculture

by

The Division of Economics and Markets

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CONTENTS

Price Review for May, 1942.*

SLAUGHTER CATTLE.—Relatively stable supplies of cattle on the Johannesburg market led to small price increases of 1s. 2d. to 1s. 5d. per 100 lb. for all classes, except good mediums, which showed a further fairly sharp increase of 3s. 1d. to 47s. 5d. per 100 lb. estimated dressed weight *on the hoof*. In Durban larger supplies resulted in a price decline of 1s. 4d. per 100 lb. for medium and 2s. 5d. per 100 lb. for compounds.

Slaughter Sheep.—Supplies of sheep on the Johannesburg market were steady, so that prices were fairly stable, with only slight increases. Prime merinos increased from 8·8d. per lb. dressed weight *on the hoof* in April to 9·1d. per lb. in May, while medium merinos and prime crossbreds increased by 0·2d. per lb. to 7·9d. and 8·1d. per lb. respectively. On the Cape Town market a general price decline occurred, e.g., prime merinos from 9·7d. per lb. in April to 9·0d. in May, and medium merinos from 8·8d. per lb. to 8·2d. per lb.

Pigs.—Pig prices declined generally on the Johannesburg market, e.g. prime porkers from 5·5d. per lb. in April to 5·0d. per lb. in May; prime baconers from 8·2d. per lb. to 7·8d. per lb.

Feeding Stuffs.—Supplies of feeds were very inadequate and further price increases were recorded. Cape lucerne on the Johannesburg market increased further during May to 7s. 5d. per 100 lb., Transvaal lucerne to 6s. 11d. per 100 lb. and teff hay to 6s. 6d. per 100 lb. Lucerne prices were 1s. 5d. to 1s. 9d. higher than in April, while teff hay was 2d. higher.

Potatoes.—As was the case during April, Orange Free State and Transvaal potatoes supplied the steady demand on practically all the Union markets. No market was oversupplied except in the case of the Cape Town market, which was oversupplied for a short period.

*All prices mentioned are averages.

After the third week of the month, however, Transvaal consignments decreased and the presence of convoys stimulated the demand.

In general, good quality realized high prices, but in some cases, especially Pietermaritzburg and Bloemfontein, the quality was mediocre and even inferior; for the rest it was good. The quantities sold on most markets exceeded those of April 1942 and May 1941 considerably. Prices for Transvaal No. 1 on the Johannesburg market increased to 15s. 11d. per bag in May and for No. 2 to 16s. 1d. per bag. On the Cape Town market Cape No. 1 increased further to 20s. 2d. per bag and on the Durban market Natal No. 1 rose to 18s. 7d. per bag.

Onions.—Up to the middle of the month, practically all the markets received good supplies of Cape onions and the demand was relatively strong. Towards the end of the month the supplies decreased generally, while the demand continued strong, resulting in considerable price increase. On the whole the supplies were smaller than during April. Prices for Cape onions on the Johannesburg market remained unchanged at 12s. 10d. per bag, while they increased from 7s. 6d. to 10s. 7d. per bag on the Cape Town market.

Vegetables.—The relatively large supplies of pumpkins, cabbages and cauliflower which came forward during April were continued in May. Green beans were very scarce on some markets, especially Cape Town. Considerable supplies arrived from the lowveld, however, and prices dropped later in the month. Supplies of green peas improved considerably. The demand for all vegetables was steady, and good prices were obtained. In some cases, where the supply was short, excessive prices were paid.

Tomatoes.—During the first half of the month the supplies of tomatoes were generally small, and prices were generally high. Supplies on the Johannesburg market were plentiful, and prices showed a slight drop. Later during the month the supplies on the other markets increased and though demand was good, prices dropped. On the Cape Town market the transition from local supplies to that from the Transvaal lowveld caused prices to increase from 1s. 8d. per tray during April to 2s. 10d. in May. The tomatoes, however, were still in a green condition.

Deciduous Fruit.—Fairly large supplies of grapes and apples continued to arrive in May, especially grapes being plentiful. Towards the end of the month supplies decreased, and with a lower average quality prices also tended to decline. *Citrus.*—Supplies of oranges increased on all markets in comparison with the previous month. In a number of cases the irregularity of consignments from the Transvaal toward the end of the month reduced the offerings, and prices rose to very high levels. Cape and Natal oranges, however, replaced those from the Transvaal, and the supply became steadier. The quality improved and though prices generally decreased somewhat, they were stable. Other citrus fruit were relatively scarce and realized high prices.

Eggs.—Egg supplies continued low during May, and prices increased further above the already high level for April. On the Cape Town market prices advanced 10 per cent., while on the Durban market, new laid eggs realized up to 5s. per dozen; the average price on the Durban market, however, remained constant at 2s. 10d. per dozen. On the Johannesburg market the price of new laid eggs increased from 2s. 3d. per dozen in April to 2s. 6d. per dozen in May.

Monthly Indexes of the Volume of Sales and Prices of Citrus Fruit.

THE annual quantity and value of citrus fruit sold on eight municipal markets in the Union from 1937 to 1941 is shown in the tabulation below. The eight markets comprise the municipal markets of Pretoria, Johannebsurg, Bloemfontein, Cape Town, Port Elizabeth, East London, Durban and Pietermaritzburg.

	1937.	1938.	1939.	1940.	1941.
Quantity sold..........tons	34,350	33,970	41,620	41,660	44,010
Aggregate value.......£1,000	205·8	207·4	220·6	251·6	313·0

From the above tabulation it will be observed that the volume of citrus fruit sold on the eight municipal markets increased roughly from 34,000 tons in 1937 and 1938 to about 44,000 tons in 1941 and the aggregate value, during the same period, from approximately £200,000 to £300,000.

It should be noted that these figures do not constitute the sum total of all the citrus sold or consumed within the respective municipal areas in which the eight markets are situated. In addition to the auction sales on these markets, substantial quantities were handled by private agencies which sold a portion thereof in the respective municipal areas in which they were situated, and railed the balance to nearby and smaller markets. Moreover, a small quantity sold on the municipal markets may have been resold and consumed in smaller towns. The above data, therefore, do not give an adequate picture of the actual quantity of citrus fruit sold or consumed within the eight cities mentioned above.

No accurate information is available with respect to the total quantity of citrus fruit consumed in the Union. According to information obtained from the Citrus Board, however, an equivalent of approximately 7,000,000 pockets of citrus fruit of about 30 lb. weight each were sold in the Union during 1941. Of this quantity about 6,250,000 pockets were sold as fresh fruit and about 750,000 pockets were consumed by by-product plants for the manufacture of juices, etc. The total sales of citrus fruit on the eight municipal markets would therefore appear to represent approximately 45 to 50 per cent. of the total inland sales during 1941.

From 1937 to 1941, the Johannesburg, Cape Town and Pretoria municipal markets disposed, on the average, of about 40 per cent., 24 per cent. and 12 per cent. respectively, or about 75 per cent. of the total volume of sales of all the eight markets. The five other municipal markets each handled from about 3 to 6 per cent. of the total average quantity sold during this period.

During the past five years, approximately 85 per cent. of the total volume of citrus fruit sold on the eight markets consisted of oranges, 5·5 per cent. of naartjies, 5·0 per cent. of lemons and 3·5 per cent. of grapefruit.

The table below shows on an index basis, the weighted average monthly fluctuations in the volume of sales and prices of citrus fruit sold on the eight municipal markets. The following comments are offered with repect to the construction of the two indexes. In order

to eliminate seasonal variation in the volume of sales and prices, the two indexes are based upon corresponding months, that is, the index number for any particular month denotes the percentage below or above the corresponding months of 1937, 1938 and 1939, the years taken as the base period. For example, the index number of the volume of sales for January 1940 as shown in the tabulation below, is 116. This means that in January 1940 the quantity of citrus fruit sold was 16 per cent. higher than the average quantities sold during the three Januaries of 1937, 1938 and 1939. The two indexes are based upon the calendar year and not upon the crop year. With the principal exception of Valencia oranges, the season for which extends until February or March, the crop year falls well within the calendar year. From 6 to 8 per cent. of the total average annual or seasonal production is marketed during the first two or three months of the year (see last column in table). The index of the volume of sales has been adjusted for the unequal number of days in the months, that is, it is based upon the average daily sales during the month, including Sundays and holidays. Finally, the price index is, strictly speaking, a weighted average value per unit weight index. Although a relatively small proportion of the total volume of sales is purchased by the ultimate consumer, particularly in evidence on some of the small municipal markets, this price index can, for all practical purposes, be regarded to constitute a wholesale price index of citrus fruit, as by far the bulk is bought in wholesale lots and eventually resold in small quantities to individual consumers:—

Month.	(1937-39 Average for same Month = 100.)						Monthly Sales as a Percentage of Total Sales (average 1937 to 1941).
	Volume of Sales.			Prices.			
	1940.	1941.	1942.	1940.	1941.	1942.	
							Per Cent.
January...	116	129	92	93	102	209	3·9
February..	104	125	95	106	114	193	2·1
March.....	77	148	108	137	115	157	2·0
April......	133	160	212	103	111	128	4·7
May.......	117	146	166	95	99	137	8·4
June......	104	112	—	100	114	—	12·3
July.......	113	128	—	112	112	—	12·6
August....	110	116	—	114	130	—	12·2
September.	103	112	—	118	125	—	12·5
October....	119	114	—	97	119	—	12·0
November.	117	102	—	93	142	—	10·3
December..	131	90	—	102	177	—	7·0
Weighted Average	114	120	—	104	123	—	100·0

The above table indicates that in spite of a 20 per cent. increase in sales in 1941, as compared with pre-war (1937 to 1939), average prices were 23 per cent. higher. This can largely be ascribed to the increased demand due to troop concentrations; ships stores for convoys; relatively decreased consumption of canned fruit, an appreciable quantity of which before the outbreak of war, was normally imported; better quality fruit, much of which was formally reserved for the export market; and an improved system of distribution.

Toward the end of the past season (December 1941 to February 1942) supplies were from 5 to 10 per cent. below the average for the corresponding months from 1937 to 1939, whereas prices were up to twice as high. Average prices during the first five months of this year were considerably higher than the prices for the same months of the past five years. Since the beginning of the present season (April/May 1942) supplies were notably above normal and average prices were about 33 per cent. higher than the 1937-39 April/May prices.

The Purchase and Sale of Mealies and Mealie Products.

IN the new regulations published in the *Government Gazette Extraordinary* of the 3rd June 1942 it is provided that as from the beginning of July a *bona fide* farmer will be able to purchase, without a permit, 10 bags per month of mealies, mealie products of feed mixtures containing mealies or mealie products, instead of the 25 bags per month which he could have purchased up to the end of June, as previously announced.

For persons other than *bona fide* farmers the total, which may be purchased without a permit, is still 2 bags per month.

In previous statements it was indicated, that as the maize crop was expected to be below normal, it would be necessary to introduce a general permit system for the disposal of mealies and mealie products in order to ensure, that sufficient supplies would be available to meet the country's essential requirements. Under the general permit system, which has now been introduced, any person who intends buying more mealies, mealie products or feed mixtures containing mealies or mealie products, than the quantities indicated above, must first obtain a permit from the Mealie Industry Control Board, P.O. Box 669, Pretoria. The permit system applies to all mealies or mealie products, whether used for human consumption or the feeding of animals.

Index of Field Crops and Animal Products.

RISES occurred in practically all the groups except in the case of winter cereals, which remained unchanged at 139, and pastoral products, which remained at 102. Sharp rises occurred in the hay group, namely, from 151 in April to 188 in May due to a further increase in lucerne prices; in the poultry and poultry products group, prices rose from 175 in April to 203 in May, again mainly on account of the rise in egg prices. Prices also increased in the summer cereals group, mainly on account of the fixation of maize prices at 15s. per bag, and in the dairy products group as a result of higher prices for cheesemilk, butterfat and milk for condensing.

The combined index consequently showed an increase from 125 in April to 136 in May.

(See table elsewhere in this issue.)

Index of Prices of Field Crops and Animal Products.

(Basic period 1936-37 to 1938-39 = 100.)

SEASON (1st July to 30th June).	Summer Cereals, (a)	Winter Cereals. (b)	Hay. (c)	Other Field Crops. (d)	Pastoral Products. (e)	Dairy Products. (f)	Slaughter Stock. (g)	Poultry and Poultry Products. (h)	Combined Index.
WEIGHTS.	19	13	2	3	34	6	17	6	100
1936–37	118	86	94	93	122	86	89	98	106
1937–38	89	106	112	118	98	112	105	107	101
1938–39	92	107	96	89	79	102	106	94	93
1939–40	86	106	77	93	116	105	106	89	104
1940–41	109	113	106	159	103	108	110	112	109
1941–									
January	121	115	98	121	100	104	115	96	109
February	122	115	92	115	100	104	112	107	109
March	135	115	87	125	100	104	105	125	112
April	126	116	98	167	101	106	108	151	114
May	112	116	125	160	101	109	108	157	112
June	110	116	126	183	101	111	111	150	113
July	112	118	128	241	100	130	118	145	117
August	111	118	132	216	100	130	119	109	114
September	118	118	154	228	100	130	128	108	118
October	124	119	138	268	100	128	135	115	121
November	124	137	110	250	100	128	140	118	124
December	127	137	135	199	100	122	147	128	125
1942—									
January	131	137	126	180	100	122	144	141	125
February	132	138	125	168	101	130	140	147	125
March	126	140	140	175	101	130	134	168	125
April	126	139	151	170	102	130	129	175	125
May	158	139	188	181	102	154	132	203	136

(a) Maize and kaffircorn.
(b) Wheat, oats and rye.
(c) Lucerne and teff hay.
(d) Potatoes, sweet potatoes, onions and dried beans.
(e) Wool, mohair, hides and skins
(f) Butterfat, cheese milk and condensing milk.
(g) Cattle, sheep and pigs.
(h) Fowls, turkeys and eggs.

Average Prices of Oranges and Pawpaws on Municipal Markets.

SEASON (1st April to 31st March).	ORANGES (Pocket).							PAWPAWS (Standard box).	
	Johannesburg.			Cape Town.		Durban.		Johannesburg.	
	N.M. Navels.	Other.							
		Navels.	Valencias.	Navels.	Valencias.	Navels.	Valencias.	N.M.	Other.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
1938–39	1 10	1 6	1 5	2 0	2 1	—	—	2 0	1 7
1940–41	1 9	1 7	1 6	1 11	1 10	2 4	2 1	2 2	1 0
1941—									
January	—	0 11	1 9	—	1 10	—	2 11	2 6	1 6
February	—	2 2	2 2	—	2 9	—	—	3 7	2 10
March	—	2 3	2 10	3 0	2 9	2 9	—	3 5	2 7
April	1 9	1 8	1 5	2 5	1 11	2 1	—	2 7	2 1
May	1 9	1 5	1 4	1 7	1 0	2 2	—	2 0	1 6
June	1 8	1 6	1 3	1 7	—	1 8	—	1 6	1 4
July	1 8	1 7	1 3	1 8	—	1 11	1 6	1 5	1 2
August	2 2	2 2	1 7	1 11	1 6	1 10	1 8	1 11	1 8
September	2 4	2 1	1 9	2 4	1 8	2 6	1 8	1 9	1 5
October	—	1 10	1 11	3 2	1 9	3 5	1 8	2 3	1 10
November	—	2 9	2 8	3 1	2 7	—	2 5	3 2	2 6
December	—	2 9	3 6	—	3 5	—	2 6	3 9	2 7
1942—									
January	—	2 6	3 8	2 10	4 7	—	3 11	3 3	2 1
February	—	3 11	4 5	4 7	6 10	3 9	5 8	6 4	3 3
March	—	3 7	2 11	6 6	5 10	4 3	5 6	4 1	3 1
April	2 1	2 0	1 10	3 4	5 0	3 4	2 6	4 0	3 1
May	2 4	2 3	2 1	2 3	2 3	2 6	1 2	3 8	3 1

Average Prices of Potatoes and Onions on Municipal Markets.

SEASON (1st July to 30th June).	POTATOES (150 lb.).						ONIONS (120 lb.).		
	Johannesburg.				Cape Town.	Durban.	Johannesburg.	Johannesburg.	Cape Town.
	Transvaal. No. 1.	Transvaal No. 2.	N.M. Grade 1. No. 2.	N.M. Grade 1. No. 3.	Cape No. 1.	Natal No. 1.	Transvaal.	Cape.	Cape.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
1938-39	6 9	6 2	8 10	8 1	8 3	8 10	8 3	8 10	7 4
1940-41	14 2	13 4	18 6	18 5	15 7	16 10	12 5	12 3	9 10
1941—									
January	11 4	10 1	12 4	11 7	10 2	14 4	7 3	7 3	4 7
February	8 9	8 2	12 1	11 9	14 2	11 0	6 9	7 4	4 10
March	10 10	10 7	13 9	13 8	13 0	13 5	8 1	8 10	5 4
April	14 8	14 10	19 9	19 0	19 4	17 11	8 11	9 9	7 8
May	15 3	14 4	21 1	20 11	16 9	17 11	9 9	10 3	7 6
June	17 9	17 10	22 10	22 7	18 2	21 4	10 8	13 2	9 5
July	22 9	23 5	28 0	28 5	26 8	27 6	16 1	16 1	12 11
August	18 10	19 10	26 10	27 2	24 8	24 9	13 0	19 0	15 3
September	19 2	20 1	25 1	24 8	28 0	26 7	17 1	16 9	13 9
October	26 6	24 10	28 8	28 8	33 5	29 8	11 3	17 1	12 11
November	25 0	24 3	34 1	32 11	26 10	29 8	9 1	—	10 1
December	21 5	20 1	22 2	21 11	14 9	24 8	10 3	12 4	8 1
1942—									
January	18 8	16 4	20 6	18 11	15 3	23 2	9 3	10 2	7 10
February	15 9	13 11	20 11	20 5	16 3	20 3	9 10	9 9	7 0
March	16 6	15 2	21 4	21 7	18 4	21 3	8 9	9 5	6 7
April	14 6	13 4	21 1	21 2	19 9	18 2	11 9	12 10	7 6
May	15 11	16 1	21 7	21 11	20 2	18 7	11 9	12 10	10 10

Average Prices of Green Beans, Green Peas and Carrots on Municipal Markets.

SEASON (1st July to 30th June).	GREEN BEANS (Pocket 20 lb.).			GREEN PEAS (Pocket 20 lb.).			CARROTS (Bag). (a)		
	Johannesburg.	Cape Town.	Durban.	Johannesburg.	Cape Town.	Durban.	Johannesburg.	Cape Town.	Durban.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
1938-39	1 8	2 3	2 0	2 4	1 9	1 2	3 8	2 6	6 1
1940-41	1 11	2 9	1 5	2 8	2 4	2 3	5 9	4 11	13 4
1941—									
January	1 5	—	1 3	2 11	2 8	2 9	4 8	2 1	5 5
February	1 9	1 9	1 7	2 9	—	2 6	7 11	3 0	15 1
March	1 6	1 8	1 5	3 7	4 8	2 9	9 2	3 2	13 7
April	1 10	2 5	0 9	2 9	2 8	2 9	8 7	3 8	19 5
May	1 5	2 4	1 5	3 4	3 2	1 10	6 7	5 8	13 9
June	3 0	3 5	2 11	4 6	3 6	2 2	6 4	9 0	13 3
July	6 4	6 0	6 11	6 6	3 9	5 1	8 5	9 9	10 11
August	3 0	3 7	3 10	3 6	3 0	3 8	10 4	11 6	16 8
September	2 9	4 6	3 1	3 4	3 3	2 1	8 10	9 0	12 2
October	2 0	3 9	1 9	2 5	2 0	3 6	6 4	7 1	12 10
November	2 1	3 5	1 5	4 0	2 6	4 3	7 6	7 10	8 8
December	3 1	1 7	2 2	7 2	3 9	4 2	7 6	6 1	12 8
1942—									
January	2 4	0 8	3 1	6 4	—	4 8	5 9	7 8	11 6
February	2 1	1 4	1 7	2 6	—	2 7	10 0	11 6	19 1
March	1 10	2 1	2 2	3 2	2 0	3 6	12 11	10 6	24 7
April	1 6	3 0	1 5	3 3	5 0	2 10	13 5	9 7	29 7
May	2 6	3 3	1 10	4 9	3 8	2 9	9 2	9 8	19 10

(a) Weights of bags vary, but on the average are approximately as follows :—Johannesburg, 180 lb.; Cape Town, 90 lb.; and Durban, 120 lb.

Average Prices of Slaughter Cattle and Pigs.

Season (1st June to 31st May).	Beef per 100 lb. (a) Johannesburg. N.M. Prime.	Ordinary Prime.	Good Medium.	Compounds.	(b) Durban. Medium.	Compound.	Pigs per lb. Live Weight. Johannesburg. Porkers, Prime.	Baconers, Prime.	Stores.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	d.	d.	d.
1938–39	41 9	39 0	36 3	31 7	33 0	27 4	5·3	6·2	4·9
1940–41	43 11	41 4	37 11	32 5	31 1	25 4	4·5	5·4	4·0
1941—									
January	45 7	42 11	39 6	34 7	32 2	27 7	4·8	5·7	4·0
February	45 0	41 2	38 1	32 9	29 11	24 5	4·3	6·2	4·1
March	40 6	38 3	35 5	29 7	27 11	21 4	4·2	6·1	3·6
April	42 4	39 10	36 3	30 1	29 10	25 5	4·2	5·6	3·8
May	44 6	40 8	36 10	30 9	29 4	22 1	4·2	5·6	3·9
June	43 9	41 2	37 6	32 8	32 2	25 9	4·3	5·4	3·7
July	46 5	44 5	39 10	33 5	34 6	29 11	4·6	5·6	4·0
August	47 0	44 9	41 2	33 7	35 5	29 3	4·5	5·6	3·5
September	49 11	47 1	44 2	36 11	41 9	33 11	4·8	5·6	3·7
October	56 5	53 6	50 1	44 11	46 1	34 8	5·0	5·6	4·2
November	68 4	63 2	55 5	42 8	51 4	36 4	5·5	6·2	4·8
December	72 2	68 7	60 3	43 0	49 2	33 6	5·1	6·4	4·9
1942—									
January	63 2	59 6	54 1	43 5	45 1	29 3	5·6	7·0	5·6
February	58 3	53 4	49 2	40 6	38 11	26 7	5 4	8 0	5·2
March	53 5	47 10	44 3	36 11	37 8	27 11	5 5	8 2	4·8
April	53 0	49 10	44 4	35 6	37 3	28 5	5 5	8 3	4·7
May	54 4	51 3	47 5	36 8	35 11	26 0	5 0	7 8	4·6

(a) Estimated dressed weight of cattle as sold on the hoof. As reported by Meat Control Board.
(b) Dressed weight of carcase sold on the hook.

Average Prices of Sheep per lb. Estimated Dressed Weight.*

Season (1st June to 31st May).	Johannesburg. Merino Wethers. Prime.	Medium.	Persians and Cross Breds. Prime.	Medium.	Cape Town. Merinos. Prime.	Medium.	Capes and Persians. Prime.	Medium.
	d.	d.	d.	d.	d.	d.	d.	d.
1938–39	6·3	5·5	5·8	5·1	5·8	5·6	5·9	5·7
1940–41	6·7	6·1	6·2	5·7	6·1	5·8	6·3	6·0
1941—								
January	7·0	6·5	6·5	6·0	6·3	6·1	6·4	6·1
February	7·1	6·6	6·7	6·2	6·9	6·5	6·8	6·5
March	6·7	6·1	6·2	5·7	6·3	5·9	6·2	5·9
April	7·0	6·5	6·4	5·9	6·6	6·1	6·4	6·1
May	7·1	6·5	6·6	6·0	6·0	5·8	6·3	6·0
June	7·1	6·6	6·6	6·1	6·3	5·9	6·5	6·2
July	7·7	7·0	7·2	6·6	7·0	6·7	6·9	6·6
August	7·6	7·0	7·1	6·5	7·1	6·7	6·8	6·6
September	8·2	7·6	7·7	7·0	7·2	6·8	7·2	6·9
October	7·4	6·7	7·0	6·3	6·6	6·4	6·8	6·6
November	7·4	6·8	6·9	6·3	6·8	6·5	6·9	6·6
December	8·2	7·4	7·6	6·8	6·8	6·5	6·8	6·5
1942—								
January	8·7	7·8	7·5	6·7	7·4	7·1	7·4	7·2
February	9·3	8·3	8·2	7·7	9·0	8·3	8·7	8·3
March	9·6	8·4	8·8	7·9	9·6	8·8	9·3	8·8
April	8·8	7·7	7·9	6·9	9·7	8·8	9·4	8·8
May	9·1	7·9	8·1	6·9	9·0	8·3	9·0	8·4

* As sold on the hoof. Reported by Meat Control Board.

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FARMING IN SOUTH ... AFRICA

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Editorial:

The Basis of Potato Production.

A STEADY increase in the consumption of potatoes under prevailing conditions has resulted in such high prices that production is now a paying proposition Throughout the Union, farmers are naturally making use of this golden opportunity and are not only planting more extensively in the recognised production areas, but are now growing potatoes as a sideline to fit in with the other branches of the farming enterprise, even in areas which are not so well suited to their cultivation. This applies even to urban areas, where potatoes are being planted on a smale scale for domestic use and where available ground is also being used by organizations and municipalities for increased food production as part of the war effort.

It is during times such as the present, that the utmost importance must be attached to the availability of good seed supplies for all agricultural crops. In the case of potatoes there has actually been a tendency to buy up supplies of seed for table use on account of the high market prices for table potatoes. Fortunately the Department has realised in good time that the results of such a procedure may eventually prove disastrous to the industry, especially in view of the present demand for increased food supplies. Consequently, seed-potato growers were immediately urged not only to retain their best tubers for production, but also to make full use of the Department's inspection service, in order to prevent, as far as possible, the degeneration of tubers.

It is well-known that in the Union, as in other warm countries, deterioration or degeneration of the potato plant takes place within a relatively short period, and it has therefore always been customary for seed-potato growers and large-scale producers to order supplies of sound tubers annually from cold countries where degeneration is not as serious as it is here. In the past, seed-potatoes were imported mainly from Scotland, Ireland and Canada, and multiplied here and made available as a general source of seed for planting during the following four to five years.

In some parts of the Union, degeneration takes place more slowly, and seed-potatoes can be maintained in fairly healthy condition for a greater number of years. In such areas, special efforts are made to encourage production by the establishment of seed-potato growers' associations under the rules and regulations prescribed by the Department for such bodies, which enjoy the benefit of a special departmental inspection service which has been in operation for a number of years. The most effective form of control is secured by close co-operation between such organizations and the inspectors of the Department. It is, indeed, only along these lines that a solution will be found to the problem of ensuring the production of vigorous tubers from which good yields may be expected.

Unfortunately most producers do not yet know what constitutes a good tuber and fail to realise that degeneration is brought about by virus diseases which are transmitted by aphids, and that climatic

conditions play a part in the degeneration of the potato plant only in so far as they encourage the multiplication of aphids, especially *Myzus persical*.

There is a general tendency among farmers to use the smaller tubers of a crop for seed purposes. They do not realise that it is primarily the small tubers which harbour degeneration diseases because the moment such diseases make their appearance infected plants tend to produce only undersized tubers in large numbers. Consequently, if degeneration diseases are present in the lands, they are propagated on a large scale by small tubers. This must not be taken to imply, however, that all small potatoes are infected with degeneration diseases. Undersized, immature potatoes obtained from healthy plants may safely be planted, and will in turn produce sound, vigorous plants. Selecting all the small potatoes of a crop for future planting is dangerous because any plants already infected will yield numerous undersized tubers which will cause rapid degeneration in the next crop.

It is of the utmost importance for the industry that growers should be more conscious of and better acquainted with the points of good tubers, as well as the requirements for its production, since this knowledge will contribute largely towards ensuring longer protection of the country's seed-potato supplies against deterioration, and securing larger yields per morgen with the same cultivation. If potato-growing is to remain profitable, growers must do everything in their power to apply the best methods of cultivation and to plant only the best tubers. The existing prejudice on the part of growers against tubers from certain areas is not altogether justifiable and has resulted in large quantities of Government certified potatoes not finding a ready market.

Some associations have in stock considerable quantities of large tubers (5 to 9 oz. in weight) which are eminently suitable for lands under irrigation. These tubers may be cut to save seed, but the cut surfaces should be treated with agricultural or slaked lime or with wood ash and should be spread out thinly in a cool place for 2 to 3 days to dry off thoroughly before planting.

The Department has contributed its share on behalf of the industry by placing supplies of good seed-potatoes at the disposal of farmers through the associations, and it is hoped that farmers will in their turn make use of these supplies. Applications should be sent in immediately to the Department of Agriculture and Forestry for addresses from which certified tubers may be obtained.

Diseased tubers have very often been the main cause of crop failures. Imported tubers have up to the present constituted about 5 per cent. of the annual plantings in the Union. War conditions have seriously affected the importation of potatoes for not only is there less shipping space available for such supplies to the Union, but there is also the danger of possible rotting due to delays at sea. Since most importers are not prepared to bear the risk attached to importation, the Controller of Food Supplies has, on behalf of the State, decided to import the balance of the available supply from Great Britain. As soon as these supplies have safely reached Union ports, and after the State has satisfied its own requirements, allocations will be made to those growers who placed orders with private importers and subsequently transferred them to the State. Importers who have imported at their own risk, may distribute their supplies according to their own discretion.

(L. J. Henning, Senior Crop Production Officer and Advisor to the Food Control Organization.)

Regional Improvement.

J. Joubert, Extension Officer, Ladismith, C.P.

THE efficacy of the Department's soil-erosion scheme in so far as regional improvement is concerned, is dealt with by the author in a series of articles, the first of which, dealing with the districts of Ladysmith, Prince Albert and Barrydale, was published in the January 1942 issue of "Farming in South Africa". This

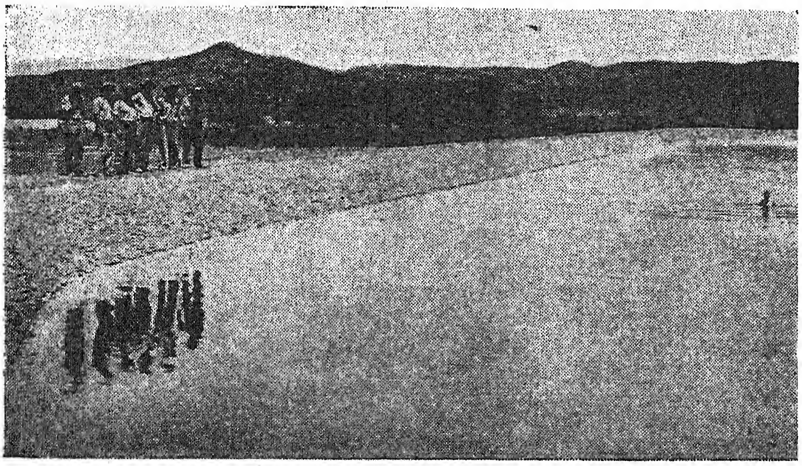

Fig. 1. A dam just completed under the Soil Erosion Scheme "C" in which the six Labourers take a particular pride.
[Photo by Author.

second article deals mainly with the question of water conservation in the districts of Paarl, Worcester, Robertson, Piquetberg and Moorreesburg.

Paarl.

In former years irrigation, as a farming practice, was unusual on the soil types of the Paarl district which are conceded to be suitable for fruit growing and viticulture, especially in the fertile valleys where wine and table-grape production was not a neglected branch of agriculture. Hilly and shallow soils were mostly planted to vines, and with the advent of Phylloxera the disease-proof American stocks were also specially selected with regard to their drought-resistant properties. After years of skilful research such a measure of success was achieved that farmers could almost invariably find a suitable stock for any particular type of soil and depend upon a fairly profitable crop during a normal rainy season.

There are many people who firmly believe that our rainfall is continually decreasing, but perhaps they no longer hold this view after last winter's experience. It is clear, however, that during the last few years, farmers in the district of Paarl have begun to realize the value of water conservation. Wherever there is a chance of tapping mountain streams, sinking bore-holes, pumping or diverting water from catchment areas into circular concrete reservoirs, they

have done so. Along Paarl mountain with its numerous granite boulders, some farmers are even collecting the run-off from the mountain surface in the same way as is done on the Rock of Gibraltar. All this shows that farmers are becoming aware of the importance of conserving some of the water which runs to waste during certain months of the year, and that there is a close correlation between production and irrigation at critical periods during the summer. It is therefore confidentially expected that they will give much more attention to this matter in future and that they will realise that there are enormous possibilities for impounding vast quantities of water.

While discussing water conservation, we can hardly leave this district without mentioning the deplorable mountain fires which destroy natural vegetation on the Drakenstein, Wemmershoek, and French Hoek mountains. This matter is one of the most serious problems to be faced, for these fires result in an irreparable loss of nature's water supply against our artificial attempts at conservation are impotent.

Worcester.

Very often Paarl is enjoying drenching rains while on the other side of the mountains Worcester is basking in sunshine. The Drakenstein and Slanghoek mountains, with peaks rising to more than 6,000 feet above sea level, form a serious barrier which impedes the passage of moisture-laden clouds from penetrating deep into the hinterland.

Worcester, with a high standard of agricultural development and a comparatively low rainfall, has taken fair advantage of the dam-building scheme. The biggest concentration of dams is in those parts where irrigation is imperative. Apart from the natural rainfall, Worcester relies mainly upon the Hex River, Tradouw and neighbouring mountains for its water supply. These high mountains feed hundreds of rivulets and streams which are tapped by the farmers in the valleys below. The way in which this supply is distributed among farmers is fixed by law, servitude or mutual agreement, each farm being given a turn of so many hours or days at weekly or fortnightly intervals. Whatever the case may be, it is quite clear that in most instances the amount of available water is the limiting factor in present and future development.

In order to supplement existing supplies, many farmers, apart from availing themselves of other forms of Government assistance or relying on individual enterprise, have taken advantage of the soil-erosion scheme. Most of the dams were built with the object of storing water after good rains or of avoiding inconvenience when leading turns fall due at awkward hours of the night.

Worcester is one of the districts where irrigation, in addition to natural rainfall, is essential in order to stabilise farm production. The scheme assisted them in this respect even on very large holdings where the facilities were not sufficiently comprehensive to fulfil all their demands. A fixed maximum bonus per farm was allowed and could not be exceeded, irrespective of capital investment or the magnitude of operations.

Robertson.

In so far as viticulture is concerned, Robertson and Bonnievale may, in certain respects be regarded as areas which, before limita-

tion, embarked upon a policy of indiscriminate planting of vines with an almost irresponsible disregard of over-production. Compared with some of the older districts, Robertson has increased its viticultural production at a rate which is altogether out of proportion to its other branches of agriculture.

The building of the Government dam at Brandvlei provided the impetus which resulted in large-scale agricultural developments. In a district where three major branches of agriculture are possible, it is to be regretted that such an enlightened community should have concentrated to such an extent on viticulture. It is an unsound policy for the individual, the district, and the whole wine industry.

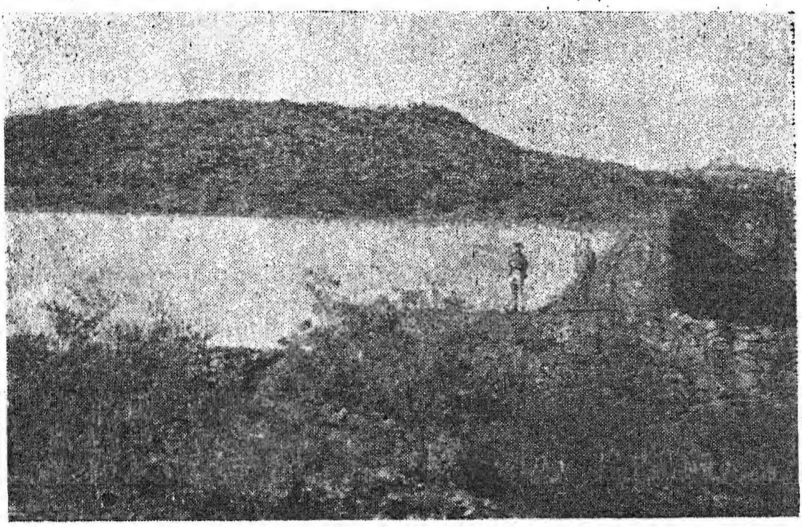

Fig. 2. One of the indespensable Dams on a Farm with 100,000 vines.
[Photo by Author.

The over-production of alcohol has reached such staggering proportions, that arbitrary legislation was introduced to check production and to avert a possible collapse.

Much of this happened before the soil-erosion scheme was introduced, and these developments are not to be associated with it. The small dams built later on are more or less adjuncts of the big scheme and were constructed for the purpose of facilitating matters by diverting leading turns into them for temporary storage, and utilization when necessary.

In the Die Hoop area, towards the mountain, many dams were built to ensure an additional water supply. With increased plantings and shrinkage of the mountain streams, farmers tried to meet the shortage of water in this way.

Piquetberg.

This village is built on the slopes of a mountain which bears the same name. On the summit of the mountain, 1,900 feet above sea level, there is a plateau. Here a community of farmers have

pioneered a type of farming adapted to the environment and quite different from that of the rest of the district.

Farming on a modern and commercial scale of production was made possible only after a certain Mr. Versveld had built a road leading from the flat wheat country below up the face of the mountain to the fertile plateau. The construction of this road was a splendid and original piece of engineering. Now, after six decades, the plateau has a large and varied production of agricultural wealth.

Even with 30 inches of rain, some of the farmers found it expedient to build dams under the scheme. Mr. F. Versfeld, owner of the farm Mouton's Vlei, finds that the rainfall is sufficient for his deciduous fruit trees which consist largely of peaches and plums, but that his citrus groves are irrigated to advantage during the dry summer months. The orange trees are planted on rich fertile sandy loam, which cannot retain all the moisture precipitated during the winter, so that additional water, apart from the rain, is required for the growth of the trees to produce and ripen the enormous crops.

Nature has endowed the plateau with an abundant supply of permanent water from fountains and springs, and it will be wrong to presume that a few soil-erosion dams have revolutionized farming mehods here. Nevertheles, it is quite certain that the dams have increased the water supply and supplemented the quantities available during the summer months when it is found necessary to irrigate.

On the wide, flat, undulating stretches below the town are the wheat fields of the district. These are not irrigated, but are dependent upon the natural rainfall. The dams built under the scheme have therefore no direct bearing upon the major branch of farming. This fact, perhaps, accounts for the partial indifference with which the farmers have tackled the scheme, and the majority of the works are thus of a mediocre type, notwithstanding the fact that the topography of the land, as well as the impervious nature of the soil, lends itself to the building of numerous dams. The rainfall which is in the neighbourhood of 16 inches in certain parts, is in any case adequate to fill the dams when built below a reasonable run-off.

The farmers who have availed themselves of the scheme are very pleased with their results. For stock-watering they now find the dams indispensable, but in a number of cases they have succeeded in establishing a few morgen of lucerne. Even more valuable, however, are the vegetable gardens which at least meet domestic requirements.

Moorreesburg and Malmesbury.

These two districts are, to a greater extent even than Piquetberg, almost essentially wheat producing areas. Being nearer the coast and with no mountain ranges to arrest the moisture, these areas can rely upon a better and more regular rainfall. Soil erosion is of a localized nature and it has probably not yet dawned upon the farmers what devastation is caused by surface erosion and what grave evils this may lead to. Sloot scouring should be checked in good time.

In these districts more dams could also have been built.

Warning against the Worm-remedy "Phenothiazine."

Dr. H. O. Mönnig, Onderstepoort.

THE rather wonderful results recently acclaimed for the drug Phenothiazine as an effective remedy against parasites in man and many kinds of worms in sheep, cattle, pigs, horses and fowls, have gradually, as more information became available, become modest, and lately even warnings were uttered against the dangers of the indiscriminate use of the remedy.

When, in 1938, American research workers found that Phenothiazine, a dye, was poisonous to certain insects, and other countries thereupon began to proclaim its merits, the tests then undertaken at Onderspoort have given results which were not so striking and they did not outweigh the disadvantages of the remedy, except in the case of certain worms of horses. It was soon realized that we have only a limited knowledge of the fate and actions of this drug in the body of the treated animal, and that its use could only be recommended when more was known about it.

Advantages and Disadvantages.

Summarized, the advantages and disadvantages of the remedy are, briefly, as follows:—

Efficacy.—In *horses* the remedy is usually very effective against strongyles, but sometimes the results are poor. It is usually ineffective against ascaris and quite ineffective against stomach worms, bots and pin worms.

In *cattle* and *sheep* the remedy is fairly effective against wire-worm, hookworms and nodular worms, but erratic results are also obtained. It is quite ineffective against tapeworms, lungworms and the liver-fluks and moderately effective against bankrupt worms.

In *pigs* it is fairly effective against nodular worms (which are rarely troublesome in the Union), moderately effective against ascaris and ineffective against other kinds.

In *dogs* and *fowls* it is on the whole unsatisfactory, being ineffective against tapeworms and only moderately effective against the roundworms which are really harmful.

Administration.—Phenothiazine is a light greenish-yellow powder, practically insoluble in water. Ordinarily it cannot be wetted with water, but various wetting agents are added by the producers, which affect the colour and allow the powder to be made into a suspension with water. In this way it can be administered as a drench. Some firms produce large pills which can be given as such, but some experience is required in the administration of pills to most kinds of animals. To horses the powder can be given mixed in bran and, as a rule, they take it fairly readily. Other animals have to be dosed and this is not always an easy matter, especially if large numbers have to be treated. *The usual dose for a sheep is 25 grams, which amounts to two tablespoonfuls* of the powder or several large pills.

Toxic Effects and Other Disadvantages.

The drug is taken up into the blood and excreted mainly in the urine in an altered condition. It readily affects the blood, causing anaemia which may last for 3 to 4 weeks, and may also do some damage to the kidneys. Quite a number of deaths have been reported. The severity of these effects depends on the state of health of the animal treated, the quantity of the remedy administered and, apparently, also on the food eaten and other factors yet unknown. Horses, and especially thoroughbreds and other light breeds, are particularly affected. Anaemic animals are risky to treat, and this is the more significant since the drug is especially effective against strongyles in horses, which tend to cause anaemia. Repeated dosing of sheep at intervals of 2 to 3 weeks often causes an initial loss of weight which is made good only after months. The cause of this is still quite obscure. When passed in the urine, the drug has a bright red colour and causes permanent staining of any wool and hair which may be soiled. Furthermore, if any of the drug is spilt on to sheep in dosing them, it turns red and stains the wool permanently.

Price.—Soon after a practical use was found for this drug its price rose and it became uneconomical as a worm remedy for sheep. The cost of the remedy per 100 sheep would amount from 30s. to 40s. or even more, depending on the form of the drug used and the doses given.

Recommendations.

At the present stage of our knowledge and with the high price of the drug, its use as a worm remedy could be recommended only for strongyles in horses if the animals are treated with the necessary caution under the supervision of a veterinarian. It is not a drug that can be recommended for general use, and much more research will have to be done on its effects before it could be considered as a satisfactory remedy againt any kind of worm parasite.

Protected Trees.

In view of the reckless destruction of certain types of trees in various districts of the north-western Cape Province, it was considered necessary to take steps for their protection. Provision was therefore made in the new Forest and Veld Conservation Act (Act No. 13 of 1941), authorizing the Governor-General to protect certain types of trees by proclamation.

The first step in this direction has already been taken by the promulgation of Proclamation No. 214 of 1941 by which the cutting of baobab trees on any land in the Union, not being Crown forest, is prohibited, as also the cutting of any of the following species of trees, viz., vaalbos, camel thorn, mimosa, withaak, swarthaak, karree and witstam, except for domestic use, in the districts of Barkly West, Hay, Herbert, Kimberley, Kuruman, Mafeking, Taungs and Vryburg.

According to Government Notice No. 1630 of 1941, any person wishing to cut down any of the above-mentioned trees should apply for permission to the Minister of Agriculture and Forestry, through the Director of Forestry, P.O. Box 334, Pretoria, from whom further particulars are obtainable.

Artificial Incubation of Eggs.

J. A. v. d. Merwe, Assistant Professional Officer (Poultry), Grootfontein College of Agriculture, Middelburg, C.P.

THE progress of the poultry industry is dependent on the incubator. Since the introduction of this apparatus the industry no longer depends upon broodiness in hens. Furthermore, the incubation of eggs at the desired time has resulted in increased productivity and, consequently, also in higher profits. Stricter attention to hygiene and the prevention of contagious diseases, such as B.W.D. and fowl typhoid, have made possible the incubation of larger numbers of chicks at a time with comparatively little labour. The amount of attention required by an incubator capable of holding 300 eggs is negligible when compared with the trouble and labour involved in the management of the hens needed to hatch a similar number of eggs. Annually thousands of chicks are incubated to satisfy the various branches of the commercial production of poultry products.

Laying hens have a comparatively short economical production period. In addition, old hens as well as unremunerative hens, and losses as a result of death have to be replaced. The production of table birds and the extensive trade in day-old chicks constitute other branches of the industry.

Principles of Artificial Incubation.

When operating an incubator for the first time, the beginner often has to cope with apparently inexplicable problems which sometimes give rise to serious misgivings. The successful operation of the incubator requires a knowledge not only of the mechanism of the apparatus but also of the physiology of the developing embryo.

(*a*) *Development of the Embryo.*—The incubation of a hen's egg denotes the embryological development of the fertilized ovum under favourable conditions during a period of 21 days at the end of which the perfectly developed chick emerges from the shell to continue an independent existence. As in the case of mammals, the chick begins its existence at the moment of fusion of the female and the male germ cells, but, in contrast with mammals, the development of the embryo of a bird takes place outside the body of the mother. The egg contains in reserve all the materials required for the growth of a perfectly-developed chick. Any abnormal or defective factor in the egg will directly or indirectly affect the sound growth and development of the embryo.

It has been found that the fertilized ovum already begins to develop at a temperature of 68° F. and that the initial development takes place in the oviduct. The drastic disturbance or suppression of this development produces a weak germ which dies in the early or later embryonic stage. It sometimes happens that adverse conditions merely weaken the embryo and that the chick eventually emerges as a fully-formed weakling which dies within a few days. These facts stress the importance of handling eggs carefully before they are placed in the incubator.

The complex bio-chemical, physiological and embryological processes which take place during the development of a chick cannot

be discussed in this article. It is interesting to note, however, that during the first 14 days the white serves mainly as food for the embryo and that the yolk performs this function for the remainder of the incubator period. On the 19th or 20th day what is left of the yolk is drawn into the body cavity. In the course of the embryonic development the shell salts, especially the calcium (ca), are broken down and utilized in the formation and building up of the skeletal framework of the chick.

As in the case of other developing organisms the embryo needs oxygen long before the lungs are formed or begin to function. Respiration increases as the embryo gains in weight, and is accompanied by a loss in moisture content of the egg.

(b) *Critical Periods during the Development of the Embryo.*—Experiments have shown that about 65 per cent. of all embryos die during two stages of the developmental period, namely, between the 2nd and the 4th day and between the 19th and 21st day. During the first period the various body organs of the chick are formed. Consequently any disturbing condition at this time has a negative and fatal effect on hatchability. From the 19th to the 21st day the chick begins to breathe through its lungs and poor ventilation or an inadequate supply of oxygen during this period results in suffocation and a high percentage of deaths in the shell. Lack of air causes the chick to turn in the shell in its search for air, with the result that the head finds its way into the pointed end of the egg. Normally the chick in the shell lies with its head in the rounded or wider end of the egg in such a position that the beak rests under the right wing and in the direction of the airspace. The legs are folded against the breast with the toes touching the head. Any other position of the dead embryo must be regarded as faulty and indicative of lack of air or some other defect.

Incubation Requirements.

In order to obtain the greatest number of healthy chickens from a setting of fertilized eggs, it is necessary to be conversant with the ideal conditions required for the hatching of eggs.

(1) *Position of egg in incubator.*—Although eggs are put in the incubator in different positions, it is not generally known that incorrect positions adversely affect the hatching results. The egg should be placed in a slanting position with the broad end up. This ensures better results since the head of the chick develops in the larger end of the egg, and, in addition, allows of a greater number of eggs being accommodated in the apparatus.

(2) *Temperature.*—Owing to the close correlation between temperature, humidity and ventilation, it is impossible to consider one of these factors without taking the other into account. They play a most important rôle in ensuring a high degree of hatchability and attention should not be given to one at the expense of the others. The temperature in the apparatus is measured by means of thermometers graded according to the Centigrade (° C.) or the Fahrenheit (° F.) scale. Although most incubators are equipped with Fahrenheit thermometers, Centigrade thermometers are used in certain makes. In order to convert °C. to ° F. the reading is multiplied by 1·8 and 32 added to the product.

The temperature requirements differ with the various makes of incubator which can be divided into two classes, namely (1) those in

which the source of heat is situated above the egg tray, the heat being radiated in such a manner that warm air is diffused throughout the egg-compartment, and (2) those in which mechanically-forced heated air circulates through the egg tray. For practical purposes, each type of machine has its own optimum temperature which is determined partly by humidity and air movement and partly by the point at which the temperature is measured. The temperature registered by the thermometer depends upon the point where the latter is placed in the incubator. In still-air machines the thermometer is placed in such a way that the mercury bulb is immediately above the surface of the eggs or about 1½ in. above the floor of the tray. In this type of machine the ideal temperatures are usually as follows:—

100-101 °F.—1st week.
101-102 °F.—2nd week.
102-103 °F.—3rd week.

In the case of forced-air incubators the ideal temperature is a constant 99½ °F. In all cases, however, it is advisable to keep to the temperature prescribed by the manufacturer.

It is easy to understand why an excessive temperature should be avoided when it is stated that developing embryos are more resistant to low temperatures than to high temperatures. These findings are completely in accordance with nature, since in the case of a sitting hen there is little likelihood of the eggs becoming overheated. It is important and interesting to indicate what actually happens in the event of overheating. (i) The rate of development of the embryo is accelerated with the result that hatching chicks begin to peck as early as the 17th instead of on the 19th day. (ii) The emergence of abnormal and deformed chicks is a characteristic result of overheating. Most of the organs, particularly the locomotive organs, are formed during the first four days and any irregularity at this stage is likely to cause deformity and malformation. (iii) The hatchability of the eggs is lowered. Chicks develop well and normally until the 18th-19th day, when they suddenly succumb in the shell. Those which do manage to break through the shell are weak and undersized, their down being short with a scorched, sticky and matted appearance. In the American yellow-skinned breeds the beak and legs of the chicks are pale and bleached, the yolk is poorly absorbed, and the shells are wet and bloody.

A low temperature, on the other hand, has a delaying and retarding influence on the rate of growth of the embryo. Development is slow, less carbon dioxide is given off, and less oxygen absorbed. The chicks are late in emerging and begin to peck only on the 21st or 22nd day; the hatching results are also poor. The chicks are large, limp and wet, and look as if they were incubated under very moist conditions. As in the case of ducks hatched under excessive temperatures, many are misshapen and deformed, and the shells are dirty and wet. Furthermore, those chicks which appear to be normal, generally do not live long.

It is unnecessary to cool the eggs. In electrically-heated incubators using forced air, the eggs are never cooled and yet excellent results are obtained. In the case of still-air incubators it is not essential for the eggs to be cooled, although cooling for as long as 20 minutes after the 15th day is not attended by ill effects. Should it happen that the temperature has risen too high, the eggs may be

cooled by drawing out the tray for a few minutes. A sudden cooling of eggs in a room with a low temperature may sometimes be disastrous.

Respiration and Ventilation.—Like any other developing organism, the embryo requires oxygen (O_2) from the very first day, and exhales carbon dioxide. A continual interchange of gases takes place between the egg and the surrounding atmosphere through the minute pores concentrated mainly near the broad end of the shell where the air space is situated. The air space has the important function of supplying fresh air to the embryo. The gradual increase in the weight of the embryo is accompanied by a corresponding increase in the interchange of gases.

Effective ventilation of the incubator thus aims at the removal of carbon dioxide (CO_2) and the provision of life-sustaining oxygen (O_2).

During the process of gas exchange there is a partial loss of moisture owing to evaporation, the rate of which is largely dependent upon the thickness and porosity of the shell. Consequently eggs with very porous shells rapidly lose moisture. In still-air incubators adequate provision for air is made from the 15th day, and the moisture is controlled accordingly. From the 18th to the 21st day when the chick commences to breathe through its lungs, every precaution should be taken beforehand to ensure proper ventilation.

Loss of Moisture.—During the incubation period the egg gradually loses weight. A certain percentage of this loss in weight is due to the loss of moisture from the egg as a result of evaporation. The rate of evaporation is determined by such factors as the thickness and porosity of the shell, vapour pressure of the surrounding atmosphere, air movement and temperature. By vapour pressure is meant the relationship between the quantity of moisture in the air at a certain temperature as compared with the total quantity of moisture which the air can hold at that temperature. The higher the temperature the greater is the amount of moisture which the air can hold, and *vice versa*. The amount of moisture in the incubator is measured by means of a wet bulb thermometer or hygrometer.

In view of the dry climate of the Union, the relationship between moisture and temperature is a very important factor, so that, except in coastal areas where the winter is comparatively wet and moist, it is practically impossible to have an excessive moisture content in still-air machines. The most favourable conditions are obtained when the moisture content of the air is 60 per cent. or the wet-bulb thermometer registers 85-89 °F.

A low moisture content of the air is characterized by a high rate of evaporation accompanied by rapid enlargement of the air space in the egg, with the result that chicks hatched under such conditions are undersized. The signs are very similar to those found in eggs hatched at too high a temperature. The empty shells are sticky and bloody; the chicks rapidly become dry and have a scorched appearance. Bits of fluff are seen floating about in the incubator and the percentage of deaths is usually high. These factors and conditions are conducive to the spread of such diseases as B.W.D. and fowl typhoid.

Where the correct moisture content of the air has been maintained throughout the incubation period, fine, large , clean, healthy chicks are obtained.

In the dry areas of the interior the use of the still-air incubator often demands the special provision of moisture by means of shallow pans containing fine sand which should be kept moist by the addition of warm water every few hours. Alternatively a perforated metal plate wrapped in canvas or hessian may be placed in the pan. A third method which is particularly effective in the incubation of goose and duck eggs, is to sprinkle the eggs, but this procedure is not recommended in the case of hens' eggs.

Sometimes the moisture content of the air in the incubator is increased by limiting the amount of ventilation. Such a step is not advisable since it reduces the hatching results. If the floor of the room in which the incubator is housed, is made of cement, it may be moistened by sprinkling water over it or else bags may be hung up in the room.

Activities During Incubation.

The hatching season is an important and busy time for the poultry farmer, who should make all the necessary preparations in good time.

Selection of Breeding Birds.—This work of selection is of the utmost importance since the offspring which are obtained will be the future producers and breeding stock. Only the best birds of the highest class should be used for this purpose. Once the egg has been laid neither its quality nor that of the fertilized ovum on which depends the profitability of the enterprise and the success of the industry, can be altered. It is better to raise a few chicks of good quality than twice as many inferior birds.

Treatment of Breeding Birds.—Good breeding birds demand good care and treatment, if eggs of high quality are to be produced. This care involves the feeding of perfectly balanced rations, comfortable housing and protection of the birds against internal and external parasites. Egg-production is a physiological function, and if the bird's body suffers any privation the result is seen in a lowered percentage of hatchable eggs, as well as in chicks with a weak constitution. Every year thousands of eggs are lost through infertility, while equally large numbers of chicks succumb in the embryonic stage as a result of the bad treatment at some time or another during incubation.

Selection of Eggs for Setting.—Poor chicks are obtained from eggs of poor quality and from the point of view of profitability, such birds are always a failure. Only the best of eggs, i.e., those of uniform size, colour and shape with sound shells should be selected. The size of an egg is closely correlated with body weight and both factors are hereditary. Consequently, the factors from which small eggs and sub-normal weights arise, can soon be bred into and established in a flock. Eggs with an average weight of 2 oz. yield the most uniform hatching results. Heavy eggs give poor results and their incubation period is usually from 10 to 20 hours longer than that of ideal eggs.

Any abnormally shaped egg, or eggs with thin brittle, weak, glossy or cracked shells must not be placed in the machine.

Eggs which have been washed, hatch out badly owing to the fact the during the process of washing the natural protective covering of the egg is removed with the result that the pores are enlarged, thus permitting of excessive evaporation. Moreover, dirty eggs carry disease germs which penetrate the shell when the egg is washed. Such eggs may be a dangerous source of infection, especially in forced-air machines, and should be avoided.

Treatment and Storage of Setting Eggs.—The first stage of the embryonic development in an egg commences while the egg is still in the body of the hen. The ideal procedure would be to place the egg into the machine immediately after it has been laid so as not to hamper development. In practice this is impossible, however, and the storing of eggs for a week is a necessary evil. In any case, eggs should never be stored for longer than a week. Experiments have shown that the hatchability of a fertile egg is in inverse ratio to the duration of storage. The older the egg, the smaller are the chances of its hatching. A high level of hatchability may be maintained by carrying out the following suggestions:—

(i) Gather setting eggs at least twice a day and keep them in a cool spot at a temperature of 50°-55° F.

(ii) Keep eggs in a horizontal position and turn them regularly every day after the first three days, or pack in egg boxes with the broad end upwards. Eggs which are kept for a few days only need not be turned.

(iii) Handle eggs carefully. If eggs are subjected to unnecessary and rough handling in transit their hatchability is impaired.

The Incubator Room.—Any room or building can, without considerable outlay, be altered and adapted to meet the requirements of incubation. It should be hygienic, have a fairly uniform temperature and be sufficiently well ventilated to provide fresh air and to ensure the removal of carbon dioxide. In addition the ceiling should be as high as possible in order to furnish a larger volume of air per egg. The moisture conditions should be good and the chamber should be spacious. It should be situated in close proximity to the dwelling.

The Modern Incubator.—The principles underlying the construction of the modern incubator are in exact accordance with the natural hatching requirements of the egg. The apparatus contains a sensitive mechanism by means of which the temperature, moisture content and air supply are controlled and kept constant. Incubators may be classified according to the method of heating, fuel requirements, size and types.

The following types of Incubator are obtainable:—

(1) Machines with natural air supply or still-air machines, and
(2) Cabinet type or forced-air machines.

In South Africa where electricity is still a luxury on farms, use is most commonly made of the still-air type in which hot air and hot water pipes transmit the necessary heat. This type of machine may be divided into two classes namely, those heated by means of coal and those operating with paraffin lamps.

The forced-air machine is generally operated by electricity, has greater advantages and is easier to handle than the still-air type. These machines are obtainable in varying sizes, holding from 50 to 20,000 eggs, and are erected in accordance with the directions of the manufacturer. The machine should stand level and be placed in a convenient position. All thermometers should be tested at least once a year by means of a clinical thermometer which may be borrowed from a chemist or the local doctor. For the purposes of this test the bulbs of the thermometers are immersed to the same depth in lukewarm water, (101° F.), which is stirred. If the thermometers are accurate, they will all register the same temperatures.

The incubator should be thoroughly cleaned at the beginning and in between hatchings by disinfecting it with cresol dip or formalin. After the disenfection process the water pans and trays may be placed in the sun for a day. The machine is then set going again and the correct temperature is registered. Before the trays are filled, however, the machine should be allowed to operate for 2 to 3 days in order to test out the thermostats, and in the case of still-air machines, the capsules. The latter are placed in hot water to ascertain whether they swell. Thermometers are placed at different points in the egg trays or compartments and the readings compared. After this the machine is loaded and, as is to be expected, the temperature will fall and remain low for a few hours until the eggs are warm. Follow the manufacturers' directions very carefully.

Summary of Optimum Incubation Conditions.

The temperature should be kept as constant as possible as indicated for each week, and fluctuations should be prevented. The beginner should examine the machine regularly in the event of strong winds, rain or a rapid fall in temperature. It should be borne in mind that, during the last few days of the incubation period, heat will be generated by the chicken and that the temperature will automatically rise.

In providing ventilation the air space of the egg should be closely observed, since this gives an indication of the rapidity and amount of evaporation taking place.

During the first week comparatively little ventilation is necessary, but more during the second week, and from the 18th to the 21st day adequate provision should be made for ventilation.

By maintaining the humidity at 60 per cent. during the period of incubation the moisture requirements of the embryo will be satisfied. Excessive evaporation should be avoided; the air-space should not constitute more than $\frac{1}{3}$ of the volume of the egg on the 19th day.

Turning of Eggs.

When the eggs are subjected to the incubation temperature, a rapid reduction of the quality of the white takes place and as a result of the heating process, the yolk and embryo are pressed against the shell. In order to prevent this, the egg should be turned regularly at least twice daily from the second day of incubation. During the first few days it is desirable to turn the eggs at least three times a day. In the case of still-air machines, the egg tray is pulled out and if too closely packed, a few eggs are removed, the remaining eggs being turned with the palm of the hand. The doors of the machine are kept closed during the turning process. After the 18th day the eggs need no longer be turned. Turn the eggs late at night and early in the morning so as to make the night period as short as possible.

Testing of Eggs.

The eggs should be tested twice during the period of incubation, the object being to remove all infertile eggs and eggs with dead embryos. This is done from the 5th to the 7th day. The test is not carried out in the case of cabinet-type machines. The embryos which were doubtful at the first test are left until the nineteenth day when all the embryos which died after the first test, are removed.

The test applied is the well-known light test, i.e., the eggs are held up against the sunlight or a strong, concentrated electric

light. Infertile eggs are clear and watery, and the dark, moving shadow (the yolk) is clearly visible. At the first test the living, growing embryo has a spidery appearance, the dark patch on the embryo resembling the body of a spider and the ramified veins the legs of the insect. A dead embryo, i.e. one which started developing and then died for some reason or other, shows few veins, sometimes adheres to the shell, or shows the typical light-red blood ring.

The eggs are placed in the hatching compartments on the 18th day and if stud-book breeding is aimed at, they are enclosed in the gauze bags on that day so that specific matings may be incubated separately and marked.

Infertile eggs may be boiled hard, ground and fed to chicks, provided that the owner prosesses a B.W.D.-free certificate and no eggs of unknown origin are hatched. Bacillary White Diarrhoea (B.W.D.) is a dangerous, infectious disease and in cases where it has broken out, serious losses have been suffered. It is safer to bury the infertile eggs and dead embryos or to feed them to pigs. Large commercial incubating concerns, sometimes send the infertile eggs to tanning factories.

Removal of Chicks.—The incubator is not opened before the 21st day, since the rapid influx of cold air may cause chicks which have not yet emerged from the shell to catch cold, and, consequently, have disastrous results. Moreover, the opening and keeping open of doors also tend to reduce the humidity of the air in the hatching compartments with the result that many of the chicks still in the shell find it difficult to emerge. Any transparent glass in the doors of certain machines must be covered so as to obviate the possibility of chicks being attracted by the light and huddling together and trampling on one another in front of the doors.

Period of Incubation.

Except for a few minor differences, the duration of the South African hatching season is the same for all areas, extending from 1 June to 15 September. The hatching of chicks intended for table purposes may be carried on throughout the year, although better growth and development are made in winter.

Generally speaking, the hatching season extends over a period of 14 weeks, but in so far as profitable egg-production is concerned, it is advantageous to hatch chicks during certain periods, and in this connection a clear distinction must be made between the heavy and the light breeds.

Pullets of the light breeds, such as, for example, White Leghorns, which are hatched early, i.e. in June or July, start laying early in December and January. During these months the price of eggs is still low and production not very profitable. It frequently happens that during March and April, the period of natural moulting, these pullets cease producing and go into a temporary moult. By this time the price of eggs has risen and, as the pullets do not begin laying until the winter is well advanced, they are very unproductive. Chicks of the heavy breeds which are hatched during this period, are not inclined to go into a temporary moult since they are later in reaching sexual maturity and, consequently, begin to lay only in February, continuing throughout the winter. The correct time to hatch chicks of the light breeds is from 15 July to 15 September, and those of the heavy breeds from 15 July to 31 August. It is better, however, to hatch chicks too early than too late, since birds hatched early in the season are reared with fewer losses.

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Salting of Gouda Cheese.

G. Vaandrager, Professional Officer, Division of Dairying.

A CERTAIN quantity of salt is added to all our well-known kinds of cheese to improve the flavour. The salt not only directly affects the flavour, but also influences the hardness of the curd, as well as the texture and the ripening process of the cheese.

Cheese containing no salt or too little salt will ripen more rapidly, but the flavour which develops during the ripening process will not be typical of good cheese and the product will be subject to defects in flavour. On the other hand, cheese containing too much salt will have a poor structure and dry texture and will ripen very slowly.

Methods of Salting.

In no Dutch text-book or bulletin on the making of Gouda cheese in factories in Holland is any mention or discussion whatsoever to be found of this method of adding salt, which is employed in most South African factories. The brine method is, however, described in all these books, and is the sole method of salting employed in Dutch factories. The cheeses, which are placed in a special bath (or tank) containing brine for a certain period (according to circumstances) absorb the required amount of salt from the brine.

The following methods of salting are employed in a large number of our cheese factories. When all the whey has been drawn, the curd is first stirred until thoroughly dry, after which, salt is added at least twice, the curd being well stirred after every application.

The necessary quantity of salt is calculated according to the weight or the number of gallons of milk, viz., 3 lb. salt for every 100 gallons or 1,000 lb.

Another method of salting Gouda cheese is to rub salt into the surface of the cheese after the product has been pressed and rounded off. This method is employed when cheese is manufactured on a small scale, but cannot be recommended for factories since it requires too much time.

The following are the disadvantages attached to stirring the salt into the curd:—

(*a*) Repeated stirring of the curd after the addition of salt, results in the loss of an unnecessarily large quantity of whey containing a high percentage of butterfat.

(*b*) The cheeses cannot be salted as uniformly as is desirable. The yield of cheese per gallon of milk varies considerably and cannot always be calculated correctly.

Advantages of Brining.

(*a*) Unlike salt, brine does not cause an additional loss of fat, and therefore has no adverse effect on the quality of the cheese.

(*b*) If the necessary attention is given to the factors discussed below, a more uniformly salted cheese can be provided—a fact which is of the greatest importance.

(*c*) It is the most practical and economical method of salting Gouda cheese when made according to the so-called " new method ".

Stage at which Salting is to be Commenced.

After having been pressed, the cheese is again placed in the mould without a cloth in order to round it off. If unpasteurized milk of doubtful quality is used, it is desirable to place the cheese in the brine on the same day on which it is made. The salt has a retarding effect on the growth of bacteria.

Cheese made from pasteurized milk, in which the development of acid in the curd is not as vigorous, need not be placed in the brine before the following day. Van Dam has shown that cheeses sometimes have a shining surface when salted before the lactose (milk sugar) has been converted into lactic acid. A further advantage is that by that time the cheeses have cooled off more completely and will cause no unnecessary rise in the temperature of the brine.

The Brine.

The brine consists of a 20 per cent. solution, by weight, of salt and water. Any quantity may be prepared, according to the size of the brine tank, but in the following proportions only: To every 20 lb. good dairy salt, 80 lb. pure water must be added. If any doubt exists with regard to the purity of the water, it is desirable to boil it first. The strength of the brine solution is usually measured by means of Baumè's hydrometer (brine meter); for fresh brine the reading should be 20 degrees Baumè (20° B.). While the cheeses are lying in the brine solution, an interchange of liquids takes place. In other words, the fluid substance in the cheese, which consists of whey, is withdrawn from the cheese and its place taken by brine solution.

The cheese loses more weight in whey than it gains in brine, and consequently becomes lighter. The green weight must therefore be ascertained after the cheese has been salted.

It is most important that the brine should be maintained at the correct strength. The brine solution is diluted by the addition of whey and consequently cheesemakers should add salt daily to maintain the strength as near as possible to 20° B.

It is not advisable to make the brine solution weaker than 20° B. since in that case early deterioration may result. On the other hand, if the salt concentration is too high, a poor rind is formed.

The Brine Bath.—It is advisable to build the brine bath in a special room. The bath should not be too shallow—a depth of 2 ft. is sufficient. As a rule the cheeses are placed flat in the brine solution, but in the event of more space being required for some reason or other, the cheeses may be placed in an upright position in the liquid. They should not be put in too close together, and the solution should be stirred daily.

The cheeses float in the liquid and the unsubmerged portion cannot absorb any salt. In order to keep the cheeses submerged and their upper surfaces wet, a bag should be placed over them. It is, however, absolutely essential to turn the cheeses regularly in order to ensure a uniform absorption of salt. This should be done twice a day during the first day or two and subsequently at least once a day.

The Condition of the Brine Solution.

As has already been stated, the brine solution is diluted by the moisture withdrawn from the cheese. This moisture contains lactic acid and certain acid salts. Consequently the longer the

brine solution is used, the greater will be its acid content; excessive acidity may be reduced by the addition of pure lime.

It is assumed that an acid content of 0·25 to 0·30 per cent., calculated as lactic acid, is the maximum which may safely be allowed.(3)

When the brine solution has been in use for some considerable time, a sediment is deposited on the bottom of the bath. When this happens the liquid is syphoned off, and the bath cleaned; the same brine may again be used quite safely. If, however, after a time the brine solution begins to emit an unpleasant smell, a fresh solution must immediately be prepared. It must always be borne in mind that some portion of the brine solution will become incorporated in the cheese, and should therefore be of the purest quality. With care, the same brine solution can be used for many months.

Time Required for Brining.

It is of the utmost importance that the cheese should absorb the correct amount of salt during the brining process: The following table is furnished for the information of cheesemakers. The duration should, however, be varied according to circumstances as discussed below. The figures are based on experience gained in South Africa.

Weight of Cheese.	Shape.	Strength of Brine.	Temp. of Brine.	Time Required.
1 lb............	Round..........	20° B.	50–60° F.	6–12 hours.
5 lb............	Loaf-shape.......	20° B.	50–60° F.	1½–2 days.
7–8 lb............	Round..........	20° B.	50–60° F.	2½–4 days.

(*a*) *Temperature.*—Heat accelerates and facilitates the absorption of salt. The best results are obtained with the brine solution at temperatures ranging between 50° and 60° F.

(*b*) *Moisture-Content of Cheese.*—The softer the cheese, i.e. the higher its moisture content, the faster does the exchange of liquids take place, and the sooner is the salting process completed.

(*c*) *Size and Shape of Cheese.*—Since the salt enters the cheese through the rind, cheeses with the largest relative surface will absorb more salt. The relation between the weight and surface of the cheese is, therefore, an important factor. Since a 1 lb. cheese has a larger surface per unit of weight, it will be adequately salted in a much shorter period than a round cheese weighing 7 to 8 lb. For the same reason loaf-shaped cheeses will absorb salt more rapidly than round cheeses of the same weight.

(*d*) *Strength of the Brine Solution.*—If for some reason or other the brine solution is not strong enough, the cheese must be left in it for a longer time and vice versa.

Further Treatment.

It is advisable to wash cheese in clean water immediately after its removal from the brine solution. The cheese may be left in the water for a few minutes since this aids the formation of a soft rind. If it is found, however, that the rind is smooth and dries well it is not necessary to wash the cheese.

Some cheesemakers place the cheeses on shelves from which superfluous brine drains back into the bath. Thereafter the cheeses are dried with a cloth before being transferred to the ripening room.

Correct Salt Content.

Since the moisture content of Gouda cheese varies appreciably, the salt content is frequently not expressed in direct percentages, but as the percentage of salt in the moisture contained in the cheese. This eliminates variations in moisture content. In Holland, Van den Burg(3), in determining the salt content of 93 good full-cream Gouda cheeses found that 70 per cent. of the determined values ranged between 3·8 and 5 per cent., with an average of 4·35 per cent. salt in the moisture contained in the cheese.

In so far as Cheddar cheese is concerned, it was pointed out in New Zealand and America by Riddet(4) and Marquardt(5) that this type of cheese should preferably contain between 1·5 and 1·7 per cent. salt. The equivalent of the figures given(5) would be about 4·4 to 4·7 per cent. salt in the cheese moisture.

The salt content of Gouda cheese may therefore be safely regulated in such a way that the moisture in the cheese contains about 4·5 per cent. salt. Cheese can be analysed at the Dairy Research Institute for the infomation of cheesemakers, but must be at least two weeks old, i.e. the salt must have had an opportunity to spread uniformly throughout the cheese.

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Artificial Incubation of Eggs.— [Continued from page 496.

Chicks hatched during the late spring, i.e. after September, are uneconomical and constitute a loss. During hot weather growth and development are poor and during this period of the year chicks are at an age when they are very susceptible to internal parasites, chicken-pox and coccidiosis, which cause serious losses.

If the hatching, rearing and treatment of chicks are not directed at maintaining the optimum growth and constitutional quality, a nominal profit only will be made. The success of the poultry-farming enterprise depends upon the successful rearing of the chicks.

Warning.—Frequently persons who lack the necessary facilities for hatching chicks, enter into an agreement with others who have the equipment at their disposal and undertake to pay a share of the hatching costs in return for the incubation of their chicks. This practice may lead to severe losses since the client's eggs may be contaminated with infectious diseases such as B.W.D. and fowl typhoid. Not only will the incubator be infected, but the eggs of other clients as well. An agreement to incubate for others should therefore be subject to the production of a guarantee that the eggs are healthy and free from infection.

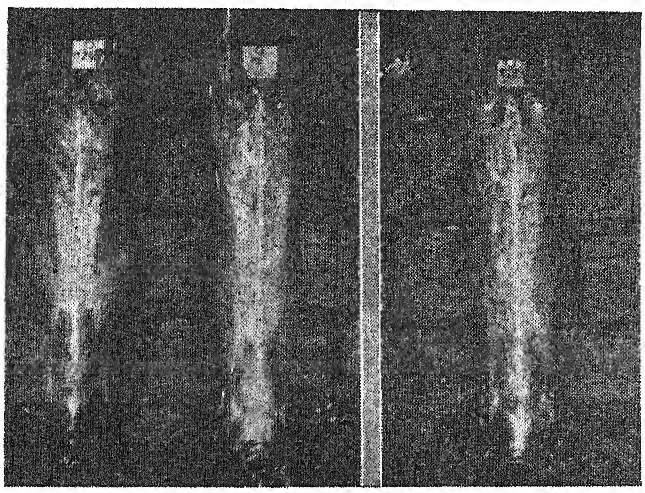
Commercial Incubating Concerns.—These are business organizations which undertake to hatch eggs at certain fixed prices and which buy thousands of eggs annually at a price slightly in advance of the market price, hatch them out and retail the chicks at a large profit. The chick produced is not always of reliable quality.

Lucerne for Fattening Sheep.

H. P. D. van Wyk and W. A. Verbeek, Animal Husbandry Research Officers, Vaal-Hartz Experiment Station.

DURING the past few years, lucerne has been utilized as grazing for sheep at the Vaal-Hartz Experiment Station. The result showed that lucerne could carry a surprisingly large number of sheep without any visible signs of deterioration in the growth and stand of the crop. These observations led to the decision to investigate the

Carcases of sheep slaughtered at commencement of experiment, 21 *October* 1941.



Merino Carcases Nos. M. 249, P2. and R.G. 37.

possibility of utilizing lucerne grazing for the fattening of sheep. In other countries, such as the United States of America, for example, lambs and sheep are purchased from breeders and then specially fattened for the market on various rations. In New Zealand lucerne is used extensivelly as grazing for fattening and feeding lambs and sheep.

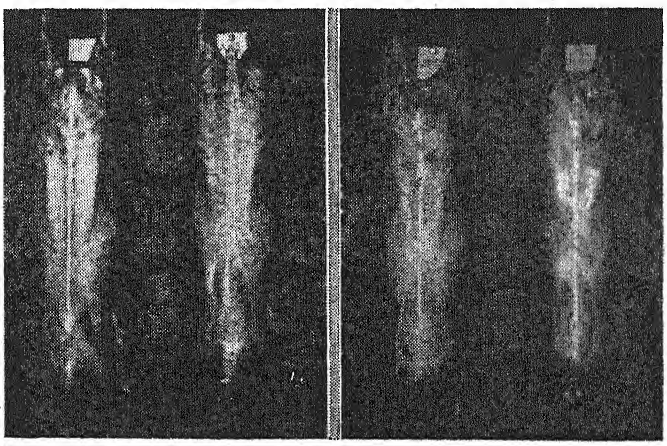
In this experiment conducted at the Vaal-Hartz Experiment Station the following sheep were used:—

Number.	Type.	Age.
36	Merino	Full mouth and old.
13	Romney × Merino	4-tooth and full mouth.
21	Border Leicester × Merino	4-tooth and full mouth.
9	Dorset Horn × Border Leicester × Merino	4-tooth and full mouth.

Of these sheep seven representative animals were slaughtered at the commencement and another six representative animals at the conclusion of the experiment in order to arrive at a more accurate comparison of the initial and the final condition of the sheep.

The sheep used in the experiment were kept on lucerne grazing for 65 days, viz., from 20th October, 1941, to 23rd December, 1941. Subsequently they were divided into two comparative groups, one group remaining on lucerne while the other was placed on grazing consisting of velvet beans and soybeans for a period of 56 days, viz., from 24th December, 1941, to 17th February, 1942.

Carcases of sheep slaughtered at commencement of experiment, 21 *October* 1941.



Romney × Merino Carcases Nos. R.M. 128, R.M. 2. Border Leicester × Merino Carcases Nos. B.L. 38 and L. 120.

Results of the Experiment.

The weight increase of the sheep during the first period of 65 days on lucerne is reflected in Table I:—

TABLE I.—*Weight increase of sheep on lucerne.*

	Merino. 33	Ro. × Merino. 11	B.L. × Merino. 19	D.H. × B.L. × Merino. 9	Whole Group. 72
Av. weight at commencement	64·58	59·50	61·58	55·89	61·92
Av. weight at conclusion......	76·33	78·82	79·37	76·89	77·58
Av. total increase...........	11·75	19·32	17·79	21·00	15·66
Av. daily increase...........	0·18	0·30	0·27	0·32	0·24

According to the above Table I, the average weight increase of 0·24 lb. per sheep per day is good and satisfactory, and compares favourably with the average weight increase of first-cross lambs at the experimental station. An average weight increase of $\frac{1}{4}$ to $\frac{1}{3}$ lb. per head per day over a period of 90 to 120 days may be regarded as good in the case of sheep of approximately 60 lb. live weight. It is also interesting to note that the weight increase of the Merino group was much poorer than that of any of the groups of cross-bred sheep.

The weight increase of a group of 4-tooth sheep and that of a group of full-mouth sheep (of the same crossing) were compared in

order to determine whether the age of the sheep had any influence on their weight increase. No difference could, however, be ascertained.

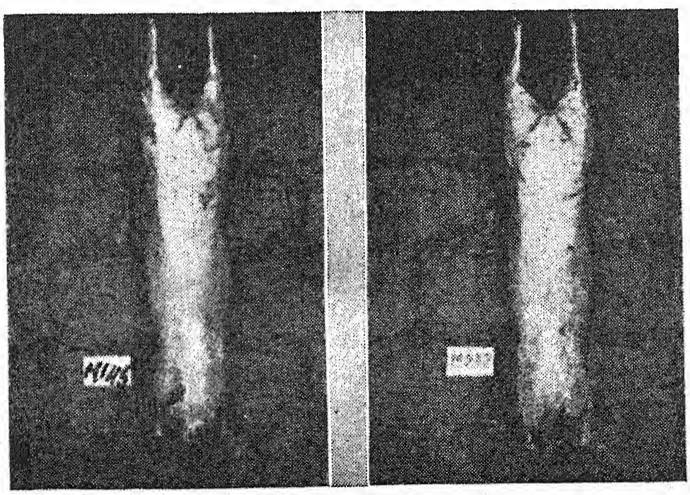
The weight increase recorded during the second period when the two groups were put on lucerne grazing (*a*) and on velvet bean and soybean grazing (*b*) is shown in Table II.

TABLE II.—*Weight increase of sheep on lucerne* (A) *and on beans* (B).

A.	Merino. A (16).	Merino. B (16).	Ro. × Merino. A (5).	Ro. × Merino. B (5).	B.L. × Merino. A (10).
Av. weight at commencement......	76·94	75·44	82·20	79·60	79·50
Av. weight at conclusion...........	78·19	86·31	79·00	94·40	82·40
Av. total increase..................	1·25	10·87	3·20	14·80	2·/0
Av. daily increase..................	0·022	0·194	0·057	0·264	0·052

B.	B.L. × Merino. B (9).	D.H. × B.L. × Merino. A (4).	D.H. × B.L. × Merino. B (5).	Whole Group. A (35).	Whole Group. B (35).
Av. weight at commencement......	79·22	76·25	77·40	78·34	77·26
Av. weight at conclusion...........	89·00	84·00	87·60	80·17	88·34
Av. total increase..................	9·78	7·75	10·20	1·83	11·08
Av. daily increase..................	0·175	0·138	0·182	0·033	0·198

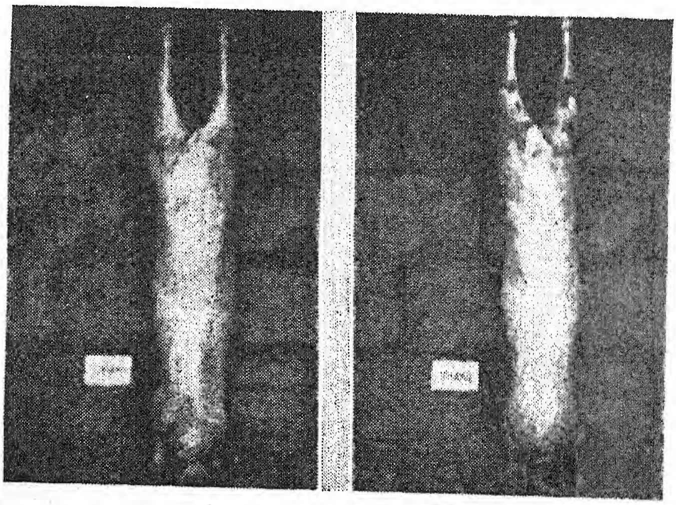
Carcases of sheep slaughtered at conclusion of the experiment, 18*th February* 1942.



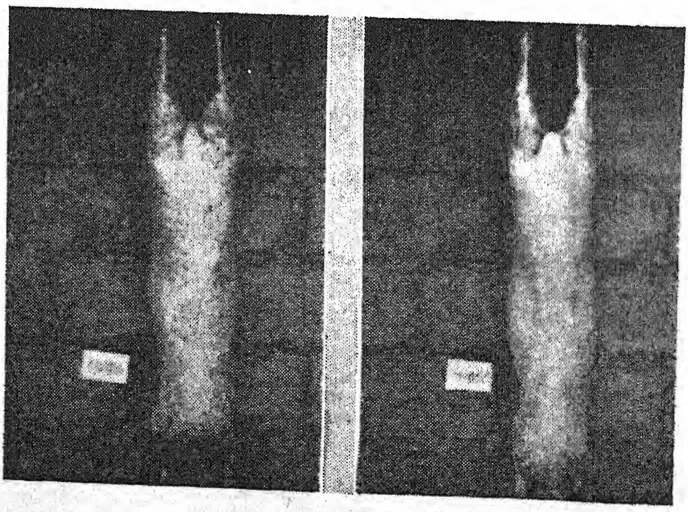
Merino Carcases Nos. M. 145 and M. 232.

From Table II it is evident that the sheep pastured on velvet beans and soybeans showed a better weight increase than those which remained on lucerne grazing. It is noteworthy, moreover, that during the second period on lucerne the sheep showed a poor weight increase in comparison with the increase during the first period on

Carcases of sheep slaughtered at conclusion of the experiment, 18th February 1942.



Romney × Merino Carcases Nos. B.M. 1 and B.M. 33.



Border Leicester x Merino Carcases.
B.L. 28 and R. 108.

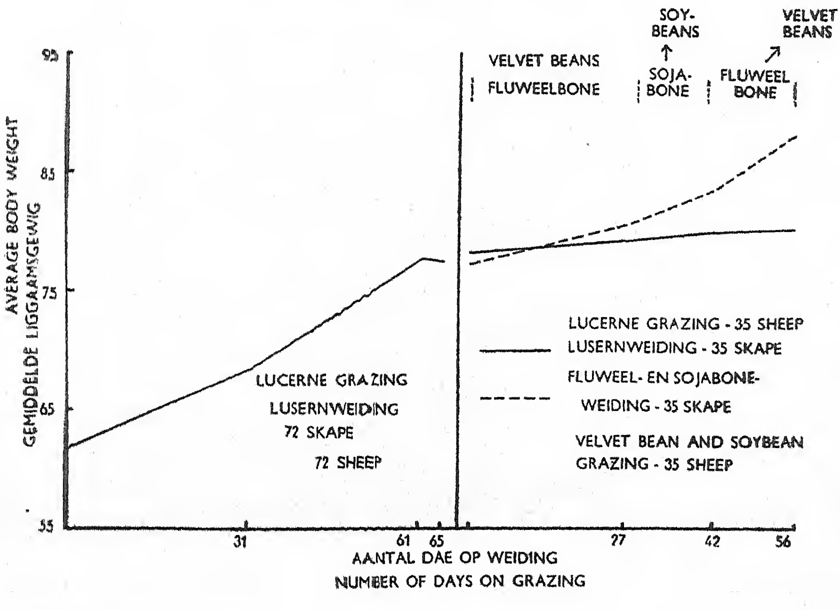
such grazing. As will be noticed from the accompanying graph, the weight increase was beginning to decline even towards the end of the first period. The weight increase of the sheep pastured on velvet beans and soybeans, however, is no better than that of the sheep on lucerne grazing during the first period.

The sheep slaughtered at the conclusion of the experiment included three animals which were kept continuously on lucerne grazing and three which subsequently received velvet bean and soybean grazing. They were selected before the experiment began.

TABLE III.—*Particulars regarding carcases of sheep slaughtered at the commencement and at the conclusion of the experiment.*

	Average.			Eye-muscle measurements (in cms.)		
	Weight before slaughter.	Weight of warm carcase.	Dressed weight percentage.	Length.	Breadth.	Fat.
	lb.	lb.				
1. Average of 7 sheep slaughtered at commencement.........	66·6	24·6	37·0	4·67	2·09	Nil.
2. Average of 6 sheep slaughtered at conclusion of the experiment....................	84·5	38·0	44·97	5·55	2·47	0·32

The carcases of the sheep slaughtered at the commencement of the experiment had no fat cover and were exceptionally lean with a very poor flesh cover. At the conclusion of the experiment, the carcases had an attractive appearance, the fat cover over the eye muscle being quite satisfactory, as is evident from Table III. The



increase in dressing percentage indicates a considerable increase in the fat and flesh cover which is also reflected in the eye-muscle measurements. The photographs clearly show the condition of the sheep at the commencement and at the conclusion of the experiment.

A Change from Lucerne Grazing.

During the experiment, the sheep grazed on lucerne in various stages of growth. Bloating was observed at all stages except the advanced flowering stage, but usually it was not of a serious nature. In a few cases (total losses 4 per cent.) sheep died as a result of bloating which occurred on a rainy night.

 [*Continued on page 526.*

Balanced Farm Feeds for Dairy Cows.

J. F. Burger, Senior Professional Officer (Animal Husbandry), College of Agriculture, Potchefstroom.

CERTAIN feeds, some of which are practically indispensable to the dairy farmer, are no longer obtainable, or if at all, only in very small quantities. This applies more particularly to wheaten bran and protein-rich oil cakes, the latter being by-products of groundnut, cotton seed, linseed and coconut oil cake. The prospects for an improvement in the position in the near future are very remote and in the meantime attention should be given to other sources of protein.

The majority of our dairy farmers are alive to the fact that sufficient protein is essential in rations, but hitherto very few have directed serious efforts at eliminating or reducing their purchases of expensive protein-rich oil cakes. To make this possible it is necessary to produce certain feeds which contain the required proteins. On a dairy farm the cultivation of crops must be based on the requirements of the cow. Farmers who disregard this fundamental principle must either be content with an extremely low production level or they must be prepared to spend large sums in cash on expensive oil cakes with which to supplement their unbalanced fodder crops.

The Self-sufficient Dairy Farm.

In the summer-rainfall areas practically every dairy farmer can be self-sufficient by producing the correct crops. Only in the case of exceptionally high producers might it be necessary to purchase one or more concentrates in order to increase the palatability of the meal ration. Under prevailing conditions, however, it is impossible to satisfy all the requirements of an ideal ration and available feeds must be utilized to the best advantage.

The most important factor in the economical feeding of cows is the available roughage, the reasons for this being the following:—

(*a*) Roughage feeds are practically always the cheapest to produce.

(*b*) Feed usually accounts for sixty to seventy per cent. of the total production costs of milk. Cheap production is therefore synonymous with cheap feeds, which again largely depends on high-production roughages.

(*c*) By far the greatest percentage of the cow's daily consumption of feed consists of roughage—hence the greater the nutritive value of the roughage fed, the smaller is the necessity for purchasing and feeding expensive concentrates. Persons feeding inferior hays to good cows clearly do not recognize this fact.

(*d*) Notwithstanding these facts, the production of roughage feeds of good quality is shamefully neglected on most farms and, as a rule, farmers attempt to maintain a high level of production by feeding heavy concentrates.

Recommendations.

For a dairy-farm in the summer-rainfall areas to be self-sufficient there are two essentials, namely, (1) the provision of *adequate quantities of feed*, and (2) *sufficient protein of good quality*.

The second requirement can be provided by cultivating legumes on dryland systems. These legumes, viz., soybeans, cowpeas and velvet beans, must be selected for their adaptability to the requirements of the particular area. Soybeans possess an additional advantage inasmuch as they can be utilized as high-quality hay while at the ripe stage, the seed may serve as a protein-rich concentrate. The hays obtained from these crops are all equally valuable and when they are fed together with soybean meal in the concentrate mixture according to the recommendations given below, it will be observed that, except in the case of very high producers, home-produced feeds satisfy the requirements of the average good dairy cow.

It has already been conclusively proved that one or more of the above crops can be successfully cultivated in all parts of the summer-rainfall areas in the Union and the inclusion of such legumes in our crop-production systems is so essential that the matter cannot be too strongly emphasized.

Rations Recommended.

Below is a series of rations from which farmers can make selection, according to the conditions prevailing in their particular areas. It is realized that the mixtures lack certain requirements, but they are the best which can be recommended in the present circumstances.

The following points should be borne in mind:—

1. The quantity of protein-rich oil cakes recommended generally depends upon the kind and the quality of roughage feeds available.
2. Maize germ meal and hominy chop may be regarded as equivalent to maize meal for all practical purposes and may be substituted for each other in equal parts by weight. Both meals are very light meals and are therefore valuable for mixing with the heavy maize meal. Their oil content is sometimes high and they are therefore liable to become rancid if stored for long periods. Maize cob meal is also useful in the absence of bulky meals such as bran, although none of these can satisfactorily take the place of bran. Where mention is made of germ meal, in the ration, hominy chop, oatmeal or maize bran may also be used. Maize bran is, however, a poor feed for cows and should not be fed in large quantities.
3. Farmers who possess hammer mills may grind lucerne, soybeans or cowpea hay and mix these with the meal mixtures to take the place of wheaten bran when the latter is unobtainable.
4. Add 3 lb. bonemeal and 1 lb. salt to every 100 lb. of the mixtures given below.
5. Feed 1 lb. of meal for every 4 lb. of milk produced ($2\frac{1}{2}$ lb. per gallon). This quantity may be reduced to 1 lb. for every 5-6 lb. milk if an abundant supply of good roughage is provided, and should be increased to 1 lb. for every 2 to 3 lb. milk if the hay is poor or the quantity small.

No. 1.—Where roughage of good quality is available, but consists entirely of grass varieties, such as for example, sudan grass, millet, sweet grass, good veld hay, good stock maize cobs, etc., to

which cows have free access, with or without siliage, the following rations are recommended:—

A. Maize meal, 400 lb.; maize germ meal, 200 lb.; ground soybeans, 300 lb.: Total, 900 lb.

B. Maize meal, 400 lb.; maize germ meal, 200 lb.; meat meal or fish meal or bloodmeal, 175 lb.; and coconut oil cake (copra) or palm oil cake, 125 lb.: Total, 900 lb.

(Cattle should be gradually accustomed to meat and fishmeal.)

C. Mixtures such as for A and B, but the maize germ meal (or hominy chop, etc.), replaced by 100 lb. ground lucerne, cowpeas, soybean hay or groundnut tops.

No. 2.—Where roughages such as those mentioned under No. 1 are available but are of poor quality due to over-ripeness or damage by rain, the following are recommended:—

D. Mixture as under No. 1A, but increase the soybean meal to 400 lb. The high oil content (20 per cent.) of the soybean meal is inclined to induce purging or loss of appetite in heavily fed cows. In that event blood, meat or fish meal may be substituted for, say, ¼ to ½ of the soybean meal.

E. As under No. 1B, but increase the meat, fish or blood meal to 200 lb. and the palm kernel to 150 lb.

No. 3.—Where roughage as under Nos. 1 and 2 are available in addition to a supplementary 6-8 lb. good legume hay (lucerne, etc.), the following are suggested:—

F. Maize meal, 300 lb.; germ meal, 200 lb.; ground soybean meal, 100 lb. (or coconut oil cake, 200 lb., plus 50 lb. fish meal or bloodmeal or 75 lb. meat meal).

G. As for No. 3F, but germ meal replaced by 100 lb. hammer-milled legume hay and maize meal increased to 400 lb.

No. 4.—Where roughages as under Nos. 1 and 2 are available in addition to 12 lb. good legume hay per cow per day, or abundant green grazing (oats, wheat, etc.), for 2 hours a day, the following may be fed:—

H. Any of the farm cereals (maize, oats, etc.), alone or mixed, will satisfy the requirements of the average cow. (By way of explanation, it may be stated that cows yielding up to 3 gallons per day will readily consume their maize meal allowance but if the meal portions is increased beyond 8-10 lb. per day, they will begin to refuse it. In that case it will be necessary for a bulkier substance such as germ meal, hominy chop maize cob meal or, better still, ground legume hay, to be mixed with the maize meal in order to make it lighter and more palatable.)

No. 5.—*Roughage Alone.*—It should be pointed out that heavy feeds are sometimes uneconomical, particularly for cream producers or in the event of concentrates becoming expensive. In such cases it would be advisable to feed only the very best cows on meal in order to save them, and to give roughage alone to all cows producing 3 gallons or less. Under such conditions a Friesland type of cow provided with 10-12 lb. legume hay plus free access to good grass hay or silage, may be expected to yield up to 2½ gallons of milk per day without any supplementary meals. This also applies to very good green veld grazing during the first few summer months before the grass runs to seed. On exceptionally good established pastures a milk production of considerably more than 2½ gallons may be expected.

The Planting of Potatoes.

O. S. Heyns, Extension Officer, Piquetberg.

ALTHOUGH potatoes used for seed are not true seeds, they also require a rest period and must be sprouted before being planted. In the case of potatoes, the period of dormancy is usually about a month or longer according to the variety and the time of the year. In order to prevent damage through rotting, tubers should be carefully stored during this period. If tubers are stored for a month or longer before they are ready for planting, they should receive special attention, as the keeping qualities of potatoes are not as high as those of the seeds of other agricultural crops.

When tubers have to be stored for longer than a month, they should be kept where the temperature will remain low, e.g., in a cool loft or storeroom, so as to retard sprouting. For this reason potatoes from hot or low-lying areas may be sent to colder or mountainous parts where they will keep longer because of the cooler climate.

Method of Storing Tubers.

Tubers should preferably not be kept in bags or in dense heaps during storage as this not only renders periodical inspection impossible but also induces the generation of heat with resultant rotting.

The most effective place in which to store potatoes is a well-ventilated storeroom, on frames, if possible. If these are not available the tubers may be spread out thinly in a cool place.

Moisture is an important factor in storing potatoes, as it is very necessary that the place of storage should be kept absolutely dry so as to prevent rotting of tubers.

Damage by insects must also be prevented. A particularly troublesome pest in stored potatoes is the tuber moth which generally lays its eggs in the eyes of tubers, which the larvae damage by boring their way under the skin.

The entrance of moths into the storeroom may be prevented by placing gauze in front of doors, windows, hatchways, etc., and by thoroughly cleaning the storehouse before storing the tubers. Control measures to the moth should also be applied in the field by ridging potatoes and by removing all tops at the time of lifting. On no account should lifted potatoes on the land be covered with their tops.

It is essential that seed potatoes should be disinfected.—In order to safeguard the crop against the possibility of infection by fungus and bacterial diseases which may be borne on the surface of seed tubers, they should be dipped or disinfected before they have sprouted. If this is not done prior to sprouting it is possible that the sprouts may be stripped during the disinfection process, or that the sprouts will be scorched by the disinfectant.

Sprouting of Seed Potatoes.

It is of the utmost importance that only sprouted tubers should be planted since such tubers germinate best, produce the most uniform stand, and are less liable to rot underground before they have had a chance of pushing their shoots above ground.

Short, thick sprouts are preferable to long, thin ones. Sprouts should preferably not be broken off before planting.

Warmth is necessary for speeding up the sprouting of tubers. After a rest period, tubers will sprout readily if the temperature is favourable. There are several ways in which the necessary warmth can be provided and the resourceful farmer is sure to find ways and means of doing this. A certain farmer, for instance, packed his tubers in crates and kept them in a part of his stable which was warmer than an ordinary storeroom. When a farmer is eager to plant at an early date he must bear in mind that the slighest increase in warmth promotes and accelerates the sprouting of tubers.

Short thick sprouts may be obtained by ensuring that tubers have sufficient light, as tubers kept in dark rooms tend to produce long, thin sprouts which are undesirable and which break off readily when handled. It is best to spread the tubers out thinly on platforms so that sufficient light may penetrate to green them and to produce short, thick sprouts. Under favourable conditions as regards light, and temperature more or less uniform sprouting will result—an important factor to be considered when tubers have to be cut.

Size and Cutting of Tubers for Seed Purposes.

Since the degeneration diseases to which potatoes are subject give rise to the formation of a greater percentage of small tubers, it is desirable that the planting of undersized tubers should be avoided in order to eliminate the propagation of degenerate plants in the subsequent crop. Under the inspection service of the Department a minimum size of 1½ oz. is allowed in the case of tubers intended for seed purposes; hence the small and, consequently, less desirable sizes are excluded for seed purposes.

When large seed tubers only are used, it would prove even more economical to cut up the largest tubers into several pieces depending upon the size of the tuber, but each piece should have at least two eyes.

Experiments have shown that excellent results may be obtained with cut tubers provided they are planted under optimum moisture and temperature conditions as, for instance, under irrigation where the ground is moist and the temperature sufficiently high for early germination at the time of planting. Under dryland conditions, good results may be expected only when planting takes place early in spring when the temperature is still low and after rains when the soil is sufficiently moist for rapid germination. The cut surfaces of tubers should be treated with slaked or agricultural lime or with wood ash in order to ensure rapid desiccation and the formation of a callus which tends to prevent rotting.

It is advisable that cut tubers should be left 2 to 3 days to dry off properly before they are planted. If tubers have to be cut they should already have sprouted and the soil in which they are to be planted should be neither too wet nor too dry. In addition the temperature should not be too high.

Cut tubers should not be thrown into bags or baskets as this will cause heating and consequently rotting. Treat the cut surfaces in agricultural lime and spread them out thinly to dry.

The cutting knife should be frequently dipped into a strong solution of formalin to prevent the spreading of diseases, especially virus diseases, which may be present in the sap of the potato.

Soil requirements of potatoes.—On no account should potatoes be planted in unsuitable soil as this practice never pays. Potatoes

[*Continued on page 514.*

Prevention of Waste in the Use of Grain Bags.

Dr. A. R. Saunders, Deputy Director of Production, Food Control Organization.

THE scarcity of bags and the difficulties of importation make it imperative that the greatest care should be exercised by all users of grain and other bags to prevent unnecessary wastage and in so doing to obtain the fullest and most economical use of the supplies available.

In the past the wastage of bags has been exceptionally high and even to-day many thousands of bags are handled so carelessly that they do not last as long as they should.

Causes of Wastage.

The following are some of the most important causes of wastage; and users of bags are advised to bring them to the notice of their employees:—

(1) *Slashing open of tops instead of carefully cutting the twine with which the bag is sewn.*—Even new bags are often treated in this manner.

(2) *Dragging bags over rough floors or over the ground.*—Nails projecting above flooring boards, sharp edges of cobble stones, rough cement surfaces and stones or other objects on the surface can be as destructive as wilful slashing. A suitable porter's barrow or some other means of moving the bags without dragging them will soon pay for itself through the saving on bags.

(3) *Insufficient protection against rodents.*—In this case there is usually a loss of contents as well as bags, and suitable methods of protection are always worth while.

(4) *Exposure to moisture through lack of proper covering or through storage under leaky roofs.*—The fibre of which bags are commonly made readily absorbs moisture and soon rots when wet or damp. Contact with other substances such as oil, gease, tar, or creosote should also be prevented.

(5) *Stacking bags direct on cement or other moist surfaces.*—This is a very common cause of damage and one which can be easily prevented by first laying a base of poles, old planks, smooth stones or other suitable objects.

(6) *Carelessness in taking samples.*—All too frequently the grain probe or sampling tube is jabbed into the bag with the maximum force, so that the sharp edges of the probe act like a knife in cutting the fibre. No matter how small the hole which is made, the cut edges soon fray and the fabric unravels. Often a knife is used to make a slit, and cases have been brought to light where holes are even kicked into the bag to get at the contents for sampling.

(7) *Tumbling bags from stacks, wagons or lofts.*—This invariably results in a certain percentage of the bags bursting or tearing along the seams. Such bags are usually a complete loss for repair is difficult and costly.

(8) *Over-filling of bags.*—When bags are too full, they are subjected to severe strain in handling or stacking. As much free space as possible should be allowed, specially when the contents are heavy, so that the bag will have a certain amount of pliancy and the forces of stress become more evenly distributed.

(9) *Not emptying the bags completely.*—Meal, flour or grain left in bags attracts rodents and is an excellent medium for the development of rot-producing moulds if the bags are damp. All bags should be thoroughly emptied by turning them inside out and shaking off remains of contents before they are put into storage.

(10) *Lack of adequate protection in storing empty bags.*—Bags will attract rodents even when there is no grain or other food substance in them, for all common rodents, and rats in particular, are very partial to the fibre for nesting purposes. As another important cause of loss is rotting through dampness, complete protection of empty bags against rodents and through drying before storing them are absolute essentials in the preservation of such bags.

Protection of Bags.

Bags containing chemical substances such as fertilizers or lime soon perish unless the injurious agents are removed. A good practice is to empty all fertilizers, etc., on to cement floors or into brick bins, and to wash out the bags thoroughly without delay. Although such bags are generally unsafe for the transportation of grain they can be put to good use in harvesting operations in the field, thereby effecting a considerable saving in grain bags.

To save costs and labour in repairing damaged bags, timeliness should be regarded as a first principle. The longer the delay the more difficult it is to repair bags and the less satisfactory is the result.

Economy and care in the use of all classes of bags are matters of extreme urgency and the full co-operation of those concerned is therefore earnestly requested.

Nursery Quarantines.

The following nursery quarantines were in force on 1 June 1942:—

(1) Subkleve's Nurseries, Johannesburg, on deciduous fruit trees (part), for pernicious scale.

(2) Page's Nurseries, Franschhoek, on citrus (all), for red scale.

(3) Long, F. P., Clumber, on citrus (whole), for red scale.

(4) Hiscock, E. O., Clumber, on citrus (whole), for red scale.

(5) Montrose Nurseries (Pty.), Ltd., White River, on citrus (whole), for red scale.

The Production of Root-crop Seed.

W. Schultz, Lecturer in Field Husbandry, Cedara College of Agriculture.

IN the past, rape, kale, turnip, swede, chou-moellier and mangel seed used to be imported. To-day, however, we have largely been thrown back on our own resources, and it is, therefore, necessary to outline the principles underlying successful seed production.

With the exception of mangels, these root crops require comparatively cool growing conditions, and, owing to their resistance to frost, they are treated mainly as winter crops in South Africa, except in the winter rainfall area. Hence they are also referred to generally as "winter roots". Irrigation or adequate rainfall is necessary in order to grow them successfully. Mangels, however, though frost-resistant to a degree, are partial to hot and dry conditions and are, therefore, regarded as a summer crop, but in their case excessive heat will also become a limiting factor, especially if it is associated with high humidity. The most suitable conditions for rape, kale, turnips, swedes and chou-moellier, particularly for seed production will be found in the higher middleveld and highveld areas where the climate in late summer and early spring is comparatively cool. Mangels, however, can be grown successfully at lower altitudes. Looked at purely from the seed production point of view it would seem that the middleveld and lower highveld will provide the right environment for mangels.

Seed Production.

There are several methods which can be used for the production of rootcrop seeds. The method which will now be outlined is not the best from the point of view of selection, but it is the easiest and cheapest and the most practicable under South African conditions. Nevertheless, much could be done to ensure seed of as high and uniform a standard as possible by eliminating weak and otherwise undesirable plants.

A portion of the ordinary crop is left standing through the winter to produce seed the following summer, or, in the case of rape and sometimes also kale and chou-moellier, even during the same winter. The seeds are produced in pods and when these have taken on a yellowish colour they should be picked off the plants, or the plants cut by sickles or knives and subsequently threshed by sticks or flails. Cutting of the plants is best done early in the morning while the dew is still about, as this prevents shedding of the seed.

Care must be taken to remove "bolters" (i.e., plants which have sent up flowering stalks during their first growing period) in the case of swedes and turnips, while early flowering plants in the case of rape, kale and chou-moellier are also best taken out, as their seed is liable to produce plants with little foliage.

Mangel seed can also be produced by the method which has just been described, but better results will be obtained if the following method is used: Select fully developed plants from your existing crop and store them until spring for seed production. In selecting

the plants, special attention must be given to soundness and shape of the roots.

The roots are lifted very carefully and after removal, without injury to the crown, they are stored away in a dry, well-ventilated shed where they are protected from frost. In spring, when the danger of late frosts is over, the roots are planted out into a well-prepared field. The distance between the rows should be sufficiently wide for safe cultivation, but in the rows the spacing can be fairly close. Irrigation or adequate rainfall is necessary to give the roots a good start. Planting may be done by making furrows with a suitable plough or by digging individual holes. The roots should be completely covered up with soil.

When the plants begin to send up their flowering stalks it is advisable to cut a small piece off the main shoot, as this prevents the plant from growing too tall and also encourages the growth of lateral shoots. The plants should be harvested only when the seed heads are nearly black and dry. The stems are made into bundles and then placed into small stooks in which they are allowed to dry until ready for carting and threshing.

Where a crop of mangels is left in the ground during winter with a view to seed production as outlined in the first method for the other root-crops, the roots should be well earthed up after all undesirable types, especially the " bolters ", have been removed.

The Planting of Potatoes.—

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produce good yields in friable soils, especially slightly acid sandy loam soils. Soil used for the planting of potatoes should be well fertilized if high yields are to be expected. The standard fertilizer mixture C is specially recommended for potatoes as it contains sufficient potash to satisfy the requirements of this crop.

To obtain the best yields it is advisable to apply a fair dressing of kraal manure to the soil to supplement its nitrogen content.

Only the best and most reliable seed should be planted to make the most economical use of the soil, labour and fertilizers applied. The importance of seed in the case of potatoes as compared with those of other crops, cannot be too strongly emphasized. Farmers must be absolutely certain of the source of their seed potatoes, as inferior tubers may result in the total failure of the crop.

As a result of the institution of the inspection service of the Department large supplies of government certified seed potatoes, as well as inspected seed from individual growers may now be obtained from associations and individual growers' association. Their addresses are obtainable on application from the Director of Animal and Crop Production, Prudential Buildings, Pretoria.

A Practical Method of making Compost.

A. W. Lategan, Extension Officer, Upington.

IN spite of the increased demand for agricultural products and the higher prices realized farmers are unable to produce to maximum capacity, owing to the scarcity of fertilizers. It is, therefore, essential that they should utilize all possible sources of fertilizer on their farms. It is a well-known fact that almost all our soils are deficient in organic material, as a result of which they have a poor water-retaining capacity, are difficult to cultivate and inclined to compact. This deficiency also results in poor growth of crops, injurious leaching of valuable plant-nutrients, and wind-erosion of certain types of soil. Vigorous efforts directed at supplementing the supply of humus in the soil will largely eliminate these problems and will enable the soil to derive greater benefit from limited applications of fertilizer. All manure, farm refuse, and plant substances such as straw, weeds, vine prunings, decomposing fodder, maize stalks and leaves and even superfluous dry grass, must be carefully collected and prepared with a view to returning it to the soil in the cheapest and most advantageous way. Considerable success will be achieved if this material is deposited in thick layers in kraals or stables where it will not only absorb valuable urine and manure, but will also partially rot. If it is possible to turn this mixture after it has been well trampled, and to moisten it very carefully when dry (having regard to the fact that too much water is harmful) decomposition will be accelerated and an excellent product obtained for the soil.

Method of Making Compost from Straw.

The following is a practical and inexpensive method of making compost from wheat straw and manure (which may be mixed with any of the above-mentioned refuse, and even with ash, bones, vegetable waste, etc):—

The straw is soaked in a pit for about four days and then packed in a long, narrow heap at the side of the pit. This heap is built up in layers approximately 9 inches thick and 6 feet wide. On every layer of damp straw a layer of manure is packed, 2 to 6 inches thick, depending upon the strength of the manure and the quantity available. The straw and manure must be mixed before the next layer is added. It is advisable to confine the height to five layers, with a covering layer of clean straw, 4 inches thick. After subsiding, the heap will be about 4 feet high. Within a few days it will become hot as a result of bacterial action and the heat will reach a maximum after approximately three to five weeks, after which the heap will gradually cool down. As soon as it has cooled down completely, it is ready for use, i.e, after about six to ten weeks. When still damp, the compost should form a clayey mass when worked in the hand. When dry, it should readily crumble in the hand.

The process is exceedingly simple and excellent compost is obtained without any difficulty, provided the air and moisture requirement of the bacteria are satisfied. In regard to moisture, the straw should be soaked until it no longer floats. This soaking process may

be accelerated by placing weights on the straw in the pit. In a narrow heap, i.e., one not wider than 6 feet, the air is given an opportunity of penetrating from the sides. The main advantage of a narrow heap is, however, the fact that the operator can pack or turn the entire heap without climbing on to it. For the same reason, the height of the heap is strictly confined to five layers. In order to retain the maximum amount of air in the material, the heap should not be allowed to become too compact.

The outer layer of material will necessarily be dried out by the sun and wind before it has been decomposed. It may, however, be mixed with the rest of the compost when applied to the soil, or preferably returned to the soaking pit.

The construction of an effective pit will reduce labour costs to a minimum.

(1) The pit should be so made, where it can be filled with water, either by means of a pump or a furrow.

(2) It is advisable to make it watertight, i.e., with a concrete lining. This will eliminate leaching of the straw, repeated filling of the pit and the possible formation of brak in the neighbourhood. If bracing wire is fixed to the sides of the pit, wooden poles may be used to keep the straw submerged in order to accelerate the soaking process.

(3) The soaking pit must be as near as possible to the threshing floor or chaff heaps, and the kraals, in order to reduce labour costs to a minimum.

(4) A long, narrow pit is most effective. A pit 6 feet wide and $4\frac{1}{2}$ feet deep, will hold just sufficient material for one heap, and will prevent waste of labour through repeated handling of the damp straw. Where several heaps are made, they should be packed parallel to the pit, the outer heaps 9 feet from the sides of the pit and the inner heaps between these and the pit. Long narrow pits of this type are particularly suited to irrigation farms, where space and straw are limited.

The Application of Compost.

An application of ten tons per morgen will yield surprising results. A section, 5 yards long, of a heap as described above, is estimated to weigh two tons, with a moisture content of 50 per cent. There is, however, little danger of too much being applied, since the compost shows no tendency to burn the soil.

The results are rapid and a starvation period need not be feared. The compost is valuable for rendering alkalinity in the soil, and for improving too rich soils which have an unbalanced mineral content. Of special importance is the fact that practically all seeds of weeds in the plant material used, are rendered harmless by the process.

In several experiments, the highest labour costs amounted to ten pence per ton, i.e., in the case of effective pits, with the straw and chaff heaps within a radius of 20 yards from the pit. This includes the costs entailed in filling the pit with straw. Wages were estimated at 2s. 6d. per nine-hour man-days.

Where manure cannot be obtained, compost of excellent quality may be made by using a fertilizer mixture of 60 lb. ammonium sulphate, 60 lb. agricultural lime and 30 lb. superphosphate per ton of straw (dry basis), bacterial action may be encouraged by sprinkling silty soil over each layer of the heap.

Diplodia and Brown-rot Gummosis* of Citrus.

Dr. F. C. Loest, Mycologist, Sub-Tropical Horticultural Research Station, Nelspruit.

FOR many years citrus growers in certain parts of the Eastern Transvaal and Eastern Cape Province have sustained heavy losses in citrus trees as a result of attacks by Diplodia gummosis and brown-rot gummosis. So far as is known, Diplodia gummosis appears only in the Eastern Transvaal whereas brown-rot gummosis may be found in the Eastern Transvaal and Eastern Cape Province. It is only in the latter province, however, that the disease has become a serious menace.

Although these diseases have been found on grapefruit, lemons, navels, Valencias, and Cape seedling trees, grapefruit and lemons appear to be more susceptible to Diplodia gummosis, and grapefruit more susceptible to brown-rot gummosis than any of the citrus varieties mentioned above.

Symptoms.

A comparison of the symptoms of these two diseases may be summarised as follows:—

Indirect Effects.	*Diplodia Gummosis.*	*Brown-rot Gummosis.*
(a) On leaves..........	At first yellowish-green, later yellow in colour. Leaves may drop gradually, but completely. Leaves may wilt and turn dry while still adhering to twigs. Later the dry leaves drop.	Ditto.
(b) On twigs...........	Normal green bark of twigs turns yellow and twigs die back.	Ditto.
External Appearance of Lesions.		
(a) Gum exudation.....	Slight to profuse flow of gum from diseased lesions.	Ditto.
(b) Condition of bark...	The bark is not softened but remains firm. When the bark dries out it shrinks and cracks. The extension of the cracks is greater longitudinally than horizontally.	Ditto.
(c) Extent to which bark adheres to wood	Bark attacked by an advanced stage of the disease is loosely attached to the wood from which it readily falls away.	Bark attacked by an advanced stage of the disease usually remains firmly attached to the wood. Small patches of bark may sometimes break away from the wood.
Internal Appearance of Lesions.		
(a) Colour of bark in early stages of disease	Drab colour.	Ditto.
(b) Colour of bark in advanced stage of disease	Usually very light grey to very light blackish-grey.	Drab colour.
(c) Colour of wood.....	Very light grey to very light blackish-grey.	Varies from a light dull brown, fawn, to dirty grey.
Depths to which wood of lesions is discoloured	The wood is usually discoloured to a considerable depth; not unusually throughout full diameter.	Usually the discoloration does not extend for more than 2 to 4 millimeters into the wood.

*A full account on these diseases will be published later in bulletin form.

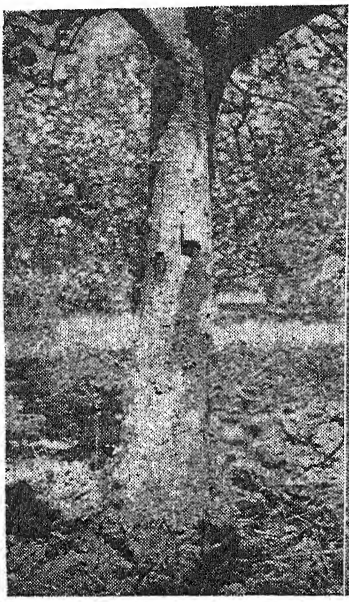

Fig. 1.—Advanced stage—gumming no longer evident—of *Diplodia gummosis* on 17-year old Eureka lemon tree.

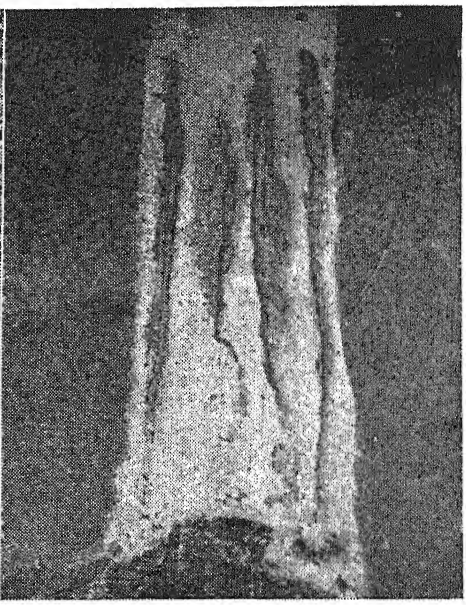

Fig. 2.—Profuse flow of gum in long narrow ridges down the trunk of a Marsh Seedless grapefruit tree attacked by brown-rot gummosis.

Causal Organisms.

By inoculation experiments it has been proved that Diplodia gummosis is caused by the fungus *Diplodia natalensis* and that brown-rot gummosis is caused by the fungus *Phytophthora citrophthora*.

Although pure cultures of *Diplodia natalensis*, which were inoculated into the trunks of healthy and vigorously growing citrus trees, were capable of producing the disease (see Fig. 3), all the disease lesions had by the eigth week from the date of inoculation become self-limited and the adjoining tissue had started to heal. Similar results attended the inoculation of the fungus into the branches of healthy and vigorously growing citrus trees. Only one of ten fungus-inoculated branches of Triumph grape-trees. Only one of ten fungus-inoculated branches of Triumph grape-fruit was killed by the fungus; the rest of the branches were only slightly affected and the lesions thereon had become self-limited at the end of two months.

Contributing Conditions.

Diplodia Gummosis.—It has been established by observation that any condition or conditions, whether cultural or climatic, which impair the vigour of citrus trees, render such trees more susceptible to attacks of Diplodia gummosis. Observation has shown that the following cultural and climatic conditions contribute to attacks of trees by the disease:—

Cultural.

(1) A low nitrogen level either as a result of the leaching of available nitrogen beyond the root zone by the over-irrigation of soils and (or) by heavy rains or as a result of the insufficient application of available nitrogen to citrus trees.

(2) Either an under-irrigation or an over-irrigation of trees, especially the over-irrigation of heavy soils or soils underlaid with hardpans or impervious sub-soils.
(3) Excessive root cutting when cultivating orchards.

Climatic.—Frost and hail injury to trees.

Brown-rot Gummosis.—The following are the main factors which may contribute towards attacks by this disease:—

(1) Allowing water to remain in contact with the bark of the trunk over a long period of time.
(2) Deep planting and (or) low budding.
(3) Mechanical injuries to the bark of the trunk, especially at its base.
(4) Inherently " weak " constitution of the tree.

Prevention.

Diplodia Gummosis.

(1) Keep trees supplied with sufficient available nitrogen for their normal development. More frequent and (or) heavier applications of available nitrogen than those usually necessary for the maintenance of the required vegetative vigour should be applied to

Fig. 3.—Typical Diplodia gummosis on 5-year old Eureka lemon tree inoculated with *Diplodia natalensis.*

Fig. 4.—Copious flow of gum from 5-year old Triumph grapefruit tree inoculated with *Phytophthora citrophthora.*

trees which have experienced a set-back as a result of frost or hail, or to trees of such varieties as the Triumph grapefruit and the lemon, which are usually consistently heavy bearers.

(2) Do not under-irrigate trees. Beware, however, of an excessive supply of water to the soil by over-irrigation, uncontrolled irrigation, or water seepage. Furthermore, over-irrigation is liable to occur when inter- or catch-crops, which require water more frequently than citrus trees, are planted between the rows.

(3) Avoid planting trees in a soil with an impervious sub-soil.

(4) Do not cultivate a soil before it is sufficiently dry. In this way the formation of a hardpan can be avoided.

(5) Avoid excessive root cutting when cultivating orchards.

In the Eastern Transvaal, trees suffering from Diplodia gummosis in its early stages, completely recovered from the disease after the adoption of the most desirable combination of the above preventive measures, but especially after the application of sufficient quantities of available nitrogen.

Brown-rot Gummosis.

(1) When irrigating, do not allow water to come into contact with the trunk of the tree, especially if the soil in the orchard is heavy. Newly planted trees, in order that they may be set properly, should be irrigated in basins made around the trunk of the tree. The protection which may be afforded such young trees by the application of fungicides, is fully dealt with by Fawcett in "Citrus Diseases and Their Control", pp. 179-180.

(2) Avoid planting trees in such a manner that the bud union is too near to or covered by the soil, since it has been established by observation that the rough lemon is more resistant to attacks than grapefruit, navels, and Valencias. (Grapefruit is more susceptible than the Navel and the Valencia). The planting of trees which have been budded sufficiently high is essential.

(3) Avoid injuring the bark of the trunk, especially at or near to its base, when cultivating orchards. Such injuries assist the entrance of the causal organism into the trunk of the tree.

(4) Plant trees which have a good, vigorous root system. Congeniality between root stock and scion is also of the utmost importance. Trees which are "weak" in the above respects, may contract the disease more readily than others.

Control.

Diplodia Gummosis.—If the disease still persists after every possible preventive measure has been adopted, diseased limbs should be cut out well into the live wood and the cut surface disinfected. The method recommended by Fawcett in his book "Citrus Diseases and Their Control" is the removal of bark and wood well beyond the visibly infected areas in the case of lesions on the trunks of trees followed by the painting over of such cut surfaces with a disinfectant (1 teaspoonful potassium permanganate to 1 pint of water and later with a good covering). It is of importance to note that this fungus is very resistant to certain fungicides such as Bordeaux mixture.

Brown-rot Gummosis.

1. *Tree Surgery.*—The best available information on tree surgery in connection with the method of gouging out the dead or

[Contineud on page 523.

Linseed and Its Cultivation.

Dr. J. H. Hofmeyr, Lecturer in Crop Production, College of Agriculture, Glen.

THE linseed or flax plant belongs to the *Linaceae* family and to the genus *Linum* of which it is the most important species. Scientfically, it is known as *Linum usitassimum*.

This crop is cultivated for two different products, viz., flax and linseed. The former consists of the stem of the plant from which the bark fibres are washed, and is used for the manufacture of linen. The latter product, viz., the seed, known as linseed, is used for many different purposes, the most important of these being the manufacture of linseed oil. An important by-product in the preparation of linseed oil is linseed cake, which is an excellent protein-rich concentrate, for dairy cows and certain other classes of livestock. The seed contains from 35 to 45 per cent. oil. Linseed is also used to a certain extent in the manufacture of various other articles such as artificial leather, linoleum and oil cloth.

The linseed or flax plant has been cultivated from time immemorial. It is presumed to be indigenous to Europe but has spread to adjoining continents where it has been grown for many centuries. Mention is made of flax in the oldest recorded histories and also in the Bible where reference is frequently made to linen, a product manufactured from flax and the most important cloth in ancient times. Wool came into use for the manufacture of cloth many centuries after linen. Egyptian mummies from 4,000 to 5,000 years old have been found wrapped in linen made from flax.

The Production of Linseed.

In spite of the fact that flax has been cultivated for many centuries, it is still comparatively unknown in the Union, where the quantity produced is so small that no separate official figures are published. It is also very improbable that any appreciable increase in the cultivation of flax for its fibre will take place in this country. There is, however, considerable scope for expansion in the cultivation of linseed with a view to seed production, especially under the prevailing war conditions, since linseed oil, which is a product of linseed, is used very extensively in the manufacture of varnishes, etc.

Two types of linseed have been developed for cultivation, viz., one with large seed production and another with smaller seeds and thinner and longer stems with fewer branches, for the production of fibre.

Climatic conditions in countries like Belgium, France, Germany, Ireland, etc., are very favourable for the cultivation of flax. Irish linen, for example, is the pride of every particular housewife.

There are, in point of fact, large parts of the Union which are quite suitable for the production of linseed. Generally speaking, it may be stated that linseed can be cultivated successfully in all areas suited to the production of maize.

Description of the Plant.

Before proceeding to a discussion of the methods followed in the cultivation of linseed, it would be advisable to enumerate a few facts regarding the plant.

Growth habit.—The linseed plant grows to a height of approximately two to three feet with branches growing from the upper portion of the stem only, the lower portion of the stem being bare. It has a thin, slightly ramified taproot and may be regarded as a gross feeder. From this may be concluded that the plant needs fertile soil, that it cannot compete with weeds and that it is not very resistant to drought.

Seed.—The seeds have a glossy surface and are usually light-brown in colour. They are flat, oval and approximately one-fifth to one-seventh of an inch long, and are borne in bolls containing five compartments with two seeds in each compartment. Each boll, therefore, produces ten seeds. The walls of the bolls are thin and are easily shattered when the seed is threshed. Unfortunately, all the bolls on a plant do not ripen simultaneously so that the crop must be harvested while some are still green, usually about three months after the seeds were sown.

Cultivation.

Linseed is cultivated as follows:—

Preparation of Soil.—The soil must be prepared very thoroughly since the linseed plant is not a vigorous grower and consequently, easily retarded in its growth by unfavourable conditions. The seed bed must be compact, however, and it may sometimes be necessary to roll the field after the seed has been sown.

The soil should be ploughed to a good depth some considerable time before sowing the seed, and then harrowed with a tined, spring-tined or disc harrow, depending upon conditions, in order to bring it into the desired state of tilth and to destroy young weeds. It is of the utmost importance that the field should be free of weeds since linseed plants are no match for weeds. Consequently, soil which is heavily infested with weed seeds should not be used for the production of linseed.

The soil must be in a productive state and an application of 200 to 250 lb. of superphosphate per morgen would be advisable in the greater part of the Union where conditions are suitable for the cultivation of this crop. Furthermore, if the fertility of the soil is to be maintained for the production of linseed, the crop cannot be cultivated on the same soil year after year. Crop rotation with such crops as grains and legumes should, therefore, be practiced. Not only does crop rotation increase the fertility of the soil but it is also an important means of controlling weeds and diseases. The latter include flax wilt disease which can cause considerable damage.

Time of Planting.—The linseed plant cannot withstand cold except when it is still young and can, therefore, not be cultivated as a winter crop for seed production in areas where frost is experienced. Consequently, it may be generally regarded as a summer crop in the summer-rainfall area and is preferably planted during November and December. If possible the soil is ploughed during winter as

for other summer crops. In the winter-rainfall areas where the temperature does not fall so low, it can be produced sucessfully as a winter crop.

Methods of Planting and Rate of Seeding.—Linseed can either be broadcast or planted with a wheat planter. If sown by hand, it must be lightly harrowed in. It is important, however, that the seed should not be planted deeper than one inch otherwise germination will be adversely affected. Fifty to eighty lbs. of seed per morgen is adequate.

Method of Harvesting.

The crop should be harvested when the major proportion of the seed is ripe. Overripe bolls are inclined to shatter and lose their seeds. The best way to cut the crop is with a self-binder. The plants are first collected in small cocks in order to dry and subsequently stacked preparatory to threshing by hand or if a threshing machine is available the cocks may be taken straight to the machine and threshed. Owing to the coarse stems and branches it is not always possible to make a compact, waterproof stack, so that further precaution should be taken to keep out rain water.

Method of Threshing.—A wheat thresher is used but it is necessary to change the sieves and to make certain other necessary adjustments.

Treatment of Seed.—In order to prevent infection with flax wilt disease, it is recommended that the seed be submerged for a few minutes in a solution of 1 pint formaline in 40 gallons of water. The treatment is the same as for the disinfection of wheat seed against stinking smut.

Yield.—The yield of linseed per morgen is usually not very high and cannot be compared with most of the other cereal or other seed producing agricultural crops. A yield of 6 to 8 bags per morgen may be regarded as satisfactory and, on the whole, a considerably lower yield is to be expected.

Diplodia and Brown-rot Gummosis of Citrus.—

[*Continued from page 520.*

invaded areas and of scraping the bark some inches beyond such areas, followed by a painting over of the gouged and scraped areas with a suitable fungicide, may be obtained on pp. 182-183 of "Citrus Diseases and Their Control" by Fawcett.

2. *Methylene blue injections.*—About 200 ccs. of a solution of methylene blue (1·5 grams refined methylene blue in 1,000 ccs. water) is injected under pressure, into the trunk just above the lesion, by means of a blow lamp of approximately 1 litre capacity specially fitted for the purpose. Failures to control the disease by means of this method have been experienced. It is generally conceded, however, that if lesions are properly treated in the early stages of the disease, satisfactory control is effected. Full details on the method of injection may be obtained from the Sub-tropical Horticultural Research Station, P.O. Box 70, Nelspruit, Tvl.

Garden Carrots.

THE carrot (*Daucus carota*) is a hardy tap-rooted plant, cultivated for its fleshy root which is very wholesome and nutritious, and abundant in Vitamin " A ".

Carrots vary considerably in size, shape and colour; the colour may be red, white or yellow.

The most suitable soil for carrots is a deep, light or sandy loam, free from weeds, and well manured for a previous crop. Carrot seed is slow in germinating, and if sown on land which produces weeds freely, the young plants are liable to be smothered before they can be conveniently cultivated. Freshly applied manure has a tendency to produce a high percentage of branched or forked roots. A deep, light soil with a friable subsoil facilitates the development of a long, smooth, fleshy root, the chief characteristic of a well-grown carrot. To obtain the best results, sowings are usually made from July to September for early summer and autumn yields, and again from February to April for winter and spring use. The earlier sowing may consist of early maturing stump-rooted or half-long varieties, such as Early Horn, Early Nantes, followed by Chantenay for succession. The main crop which is sown from February to April should include varieties such as, Scarlet, Intermediate and Chantenay.

The seed should be sown in shallow drills, not more than 1 inch deep, where the crop is to grow. The distance between the rows depends on the manner of cultivation. For hand-culture a spacing of 12 to 15 inches between the rows is sufficient. A common practice in large-scale planting is to mix a little turnip seed with the carrot seed when sowing; the turnip seeds germinate quickly and mark the position of the rows so that should the weeds get a start, cultivation may commence before the young carrots appear. When the rows can easily be observed, cultivation should be frequent and the young plants thinned out if large roots are desired.

Normally, the crop requires 90 days to reach marketable size, depending on variety.

For seed production, sowing should be done early in summer so that the crop can mature before winter. When the crop is dug up, roots typical for the variety are selected and replanted early in spring in rows 4 feet apart with 2 feet between plants to allow for development of the top. If the roots are not transplanted a large percentage of the resultant crop may prove inferior owing to the unconscious collection of seed from plants having deformed roots.

(G. Terry, Horticulturist, College of Agriculture, Cedara.)

Feeding Breeding Hens.

P. H. C. du Plessis, Lecturer in Poultry, College of Agriculture, Glen.

ONE of the most serious problems with which the poultry breeder has to cope during the hatching season is how to remedy matters in connection with the large number of chicks which die in the shell. Every precautionary measure, including the provision of sufficient moisture and adequate ventilation, the maintenance of the right temperature, the regular turning of eggs, etc., is taken, but in spite of all this a large percentage of the chicks are found dead in the shell. Such losses prevent the poultry farmer from annually replacing his old hens with young pullets of good quality. This gives rise to other problems such as low egg-production and a high rate of mortality.

Death in the shell may be due to one or more of a large variety of causes, incorrect feeding being among the most important of these. Farmers do not realize the significance of this aspect of the matter and usually blame the incubator. Experience and experiments have shown how extremely important it is that special attention should be paid to feeding and have proved that a good laying-ration does not necessarily produce good results when the eggs are used for incubation purposes.

The abnormal conditions prevailing at present and the increased prices of feeds have made it imperative that available feeds should be utilized to the best advantage. More than ever before, farmers should now endeavour to keep their production costs as low as possible. The maximum percentage of hatchability should be obtained and losses reduced to a minimum.

Feeding.

In so far as the feeding of breeding birds is concerned, it is obvious that the composition of the ration should be such as to ensure that the egg will contain all the nutrients like carbohydrates, proteins, minerals and vitamins in the correct proportions since the contents of the egg have to provide food for the embryo for at least 21 days. A deficiency of any of the nutrients mentioned above will result in low vitality in the embryo. Consequently, any minor irregularity such as for example, a slightly excessive temperature in the incubator will cause the death of a large number of embryos, because they lack the necessary power of resistance to such variable factors.

In making up rations for young breeding hens, poultry farmers should pay particular attention to the inclusion of such feeds as yellow mealie meal, lucerne meal, green feeds of good quality and milk.

Yellow Mealie Meal.—This product contains a most important nutrient, known as vitamin A which is present in the yellow pigment. White maize, kaffircorn, wheat, etc., are seriously deficient in this respect. Vitamin A promotes the hatchability of eggs and the general health of the bird. Should the ration consist of 40 per cent. of yellow mealie meal and yellow maize, as a grainfeed, the poultry-farmer may rest assured that there will be no deficiency of vitamin A. Lucerne meal is another important source of this vitamin.

Lucerne Meal.—The composition of the commercial product shows considerable variation. Sometimes it consists merely of stalks, which

have a low nutritive value. The more leaves the meal contains, the greater is its nutritive value. Lucerne also contains another factor, known as riboflavin which in the first place promotes growth but also has a profound effect on the hatchability of eggs. The quantity of lucerne meal required usually amounts to 10 per cent. of the ration. When wheaten bran was available, lucerne meal played a less important rôle in our poultry feeds. To-day, however, it is an almost indispensable ingredient of any well-balanced ration. It provides bulk and is conducive to health.

Green Feed.—It is absolutely essential to supplement the ration of breeding birds with green feed which incidentally contains the same factor as lucerne meal. Generally speaking 4 lbs. of greenfeed per day per 100 hens is sufficient.

Milk.—In nutritive value milk is supreme. Any skimmed milk available on the farm must be given to breeding hens. Such milk contains all the important vitamins and other nutrients which are necessary for growth. Rations supplemented with milk always yield good results. A hundred hens are capable of consuming as much as 3-4 gallons of sour, skimmed milk per day.

Minerals.—Calcium, phosphorus, sodium and chlorine are the most important chemical constituents. As a rule, the ingredients of poultry rations are sufficiently rich in manganese, but definitely show a considerable deficiency of calcium and phosphorus. This shortage is supplemented by the addition of oystershell powder and bonemeal. Any shortage of sodium and chlorine can be supplemented by the addition of from ½ to 1 per cent. of ordinary fine table salt to the ration.

During the past breeding season, excellent results were obtained at the Glen College of Agriculture with the following rations: Yellow mealie meal, 45 lbs.; maizegerm meal, 10 lbs.; meat meal (55 prot.), 10 lbs.; groundnut oil-cake meal, 15 lbs.; oatmeal, 10 lbs.; lucerne meal, 10 lbs.; Oystershell powder, 2 lbs.; fine salt, 1 lb.; bonemeal, 3½ lb.

The hens had free access to this mixture at all times of the day. Late in the afternoon, crushed yellow maize was fed (about 2 oz. per hen). Green feed, about 1 oz. per hen, was given once a day. Oystershell and grit were fed in separate hoppers.

Lucerne for Fattening Sheep.—

[*Continued from page 505.*

The results of this experiment show that it is possible to fatten sheep on lucerne grazing. Since high yields can be obtained from lucerne, this crop can be utilized economically to a much greater extent for the fattening of sheep.

There are several factors, however, which restrict the general adoption of such a practice, the most important of these being (1) the fact that sheep after a certain time become tired of lucerne grazing alone (as happened in this experiment), and (2) the risk of losses due to bloating. The latter problem is still being investigated by the Department and it is hoped that a practical solution will be discovered. The first difficulty can easily be avoided by varying lucerne grazing with some other fodder crop—as was done in this experiment.

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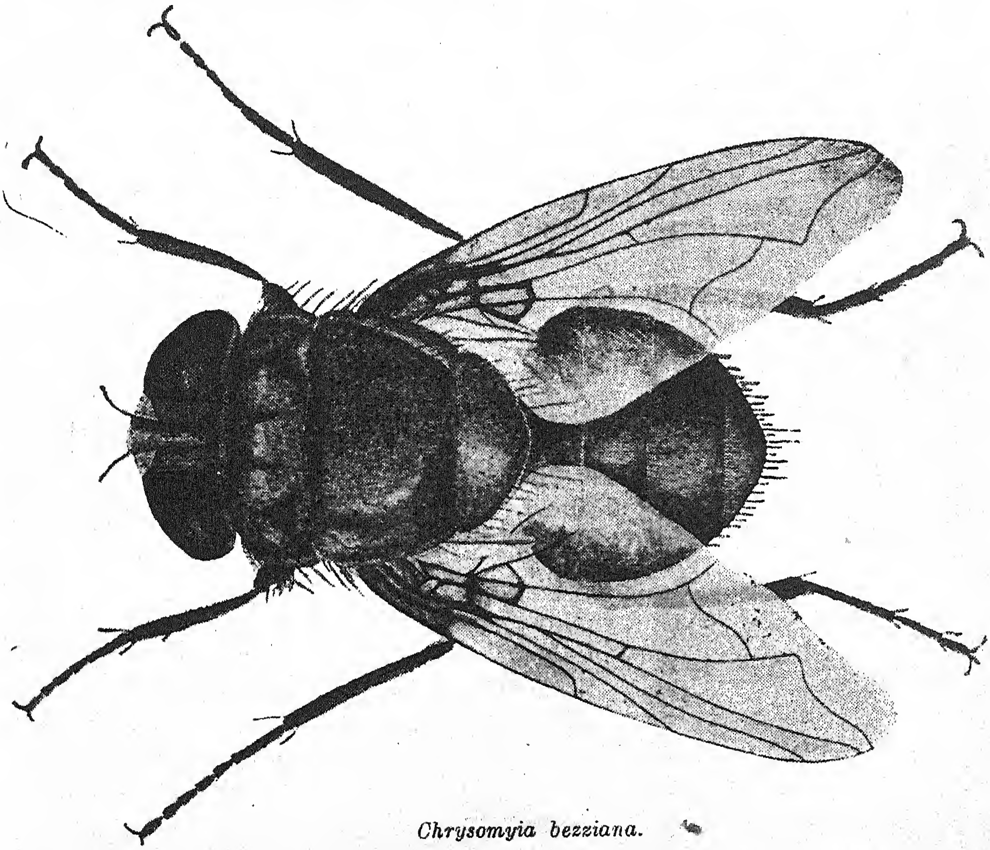
The Cattle Screw Worm.

Dr. H. O. Mönnig, Onderstepoort.

VARIOUS kinds of maggots may be found in wounds on cattle. Sometimes they are the maggots of the sheep blowfly *Lucilia cuprina*, but usually and especially in the warmer areas of the Union, where this condition frequently occurs, they are maggots of the cattle screw-worm *Chrysomyia bezziana*.



Chrysomyia bezziana.

The fly is fairly short and stout, about ⅜ inch long, dark bluish-green in colour, with rust-brown eyes and a yellow face. The first segment of the body, just behind the head, bears four indistinct dark marks. The fly can be differentiated from the large blue-bottle, in that the latter is larger in size and has a dark band on the front edge of each wing.

Distribution and Life Cycle.

The fly occurs in the warm, moist regions and is particularly troublesome in the lowveld or bushveld areas of the Transvaal and Natal. In wet summers it also spreads to adjoining regions in which it otherwise rarely occurs.

The fly lays its eggs, and the maggots develop only in wounds on live animals, and not in carcases or any other animal or vegetable

matter. (It is therefore very important to kill all maggots found in wounds). The eggs hatch in about 18 hours and the maggots become full grown in six to seven days. Then they drop off the animal and burrow into the soil where they pupate. After about a week in warm weather, or considerably longer in cool weather, the adult flies emerge.

Infection.

Infection of wounds occurs mainly in summer. Cattle are chiefly attacked, but other animals, such as horses, dogs, pigs and wild animals, may also suffer. Any wound may become infected, but the most important starting points are wounds caused by the bontleg and bont ticks.

The maggots burrow deeply into the tissues and produce large wounds from which a foul-smelling fluid oozes out. The maggots lie deeply embedded, closely packed together in the wound so that only their hind ends are visible.

Treatment.

The object of treatment should be to kill all maggots effectively and that the wound should thereafter heal rapidly without reinfection. The maggots are extremely resistant and there are few remedies which really kill them. The maggot-killing remedy is best sprayed into the wound so as to make good contact with the maggots, and then, after one or two minutes, the dead maggots should be thoroughly removed and the wound thoroughly cleaned. In cases with large, deep wounds it is desirable to keep the animals in a small paddock near the homestead and to examine and treat them again if necessary after two days, for it is expecting too much of any remedy to heal such cases with a single treatment.

Preventive Measures.

As the flies are not attracted by carcases or other bait, they cannot be caught in traps. The most important preventive measures are:—

(1) Cattle should be examined at least once a week, and infected as well as all other wounds should be treated in order to kill all maggots and to prevent reinfection.

(2) Effective tick control will reduce the screw-worm trouble considerably by reducing the number of wounds on animals.

(3) Avoid wounds by performing operations such as branding, castrating, etc., as far as possible only in winter.

Blowfly Spray.

The Division of Veterinary Services now makes available a spray for the treatment of infected cattle (and sheep) in quantities of 1 gallon (price 6s. with tin), or 5 gallons (price 27s. 6d. with tin, or 17s. 6d. without tin). The 5 gallon tins are strongly made and can be returned to the Director of Veterinary Services, Onderstepoort, *Pretoria North Station*, railage paid, for refilling.* The name and address of the owner must be clearly indicated on the tin. The Director of Veterinary Services reserves the right of deciding whether a tin is suitable for further use or not. Farmers are earnestly requested to prevent dirt from getting into the tins, because it would not pay to clean them. The tins should not be rinsed with water.

The spray is issued only on pre-payment or c.o.d. *by rail.*

* Farmers can also send their own tins for filling, at 3s. 6d. a gallon provided the tins are clean and dry.

The Farm Home.

(A Section devoted mainly to the interests of Farm Women.)

Sheep Wool for Weaving Blankets.

Miss H. J. A. Olivier, Home Economics Officer, Department of Agriculture and Forestry.

WEAVING is the art of interlacing longitudinal threads called the warp with a series of transverse, weft or woof threads, also known as "picks" or "shots", so as to form a cloth. The number of warp threads remains the same throughout the weaving process. The shots are inserted one by one and interlaced with the warp threads; the number of such shots, therefore, increases steadily as the weaving proceeds.

The Warp.

First decide upon the size of the blanket to be woven. Should the width of the loom be less than 60 inches, a piece of cloth should be woven which will have half the width and twice the length of the blanket. The finished cloth can then be cut in half and the two pieces joined to form a blanket of the required size. When the length and width of the blanket have been decided upon, the length and width of the warp should be calculated.

Assume that a blanket 60 × 80 inches is to be woven on a loom 33 to 54 inches wide, with a reed having 10 eyes to the inch.

The width of the warp will be half the desired width of the blanket + $^1/_{10}$th of this width (the tenth being added because shrinkage of the cloth takes place in the weaving process). The length of the warp will be twice the desired length of the blanket + $^1/_{10}$th of the length + 1 to 3 ft., the tenth being allowed for shrinkage in length and the additional 1 to 3 ft. representing the waste in the loom. In the case of 33 to 54 inch. loom, 24 inches are usually added. For a blanket measuring 60 by 80 inches, the width of the warp will therefore be equal to $\frac{1}{2} \times 60 + (^1/_{10} \times 30) =$ 33 inches.

Then calculate the number of threads required to give the desired width. This will depend upon the fineness of the yarn used and the desired texture of the blanket. Ten threads to an inch give satisfactory results. Consequently, 33×10 warp threads will be required. Two additional threads are added to double the two outside selvedge threads which gives a stronger selvedge. The number of threads required will therefore be 332. Excluding the two selvedge threads, the number should be divisible by 4, since there are 4 heddles or shafts. The number of threads used should therefore be 334. The length of the warp will thus be equal to $2 \times 80 + (^1/_{10} \times 160) + 24 = 200$ inches.

The quantity of wool required for the warp can be calculated. Spun wool is usually obtainable in hanks. Take a 1 oz. hank of wool, count the number of loops and then calculate the length of the hank. The number of ounces needed for the warp is equal to the length of the warp multiplied by the number of threads in the warp, divided by the length of the hank $\times 2 \times$ the number of loops in the hank.

Slightly less wool is used for the woof. For the blanket described here, from 3½ to 4 lbs. of wool are used. The thickness of the wool is approximately that of thin 4-ply knitting wool.

At this stage everything is in readiness for the making of the warp. This can be done in various ways on different equipment. The most inexpensive and also the most effective equipment is the warp frame shown in Fig. 3. The warp frame is hung against a wall. If hank containers are available, the yarn may be placed on them, but if not, the wool should be rolled into balls and placed in two fruit jars or any suitable containers. Join the ends of the threads of the two balls and hook the thread over peg No. 1. Take the two threads past peg No. 2, cross them between 2 and 3, and take both together round pegs 4 and 5; continue in this way until peg No. 14 is reached. Lace them in between 14 and 15, round 15, then again between 15 and 14, and back along the same way until No. 3 is reached. One thread should now pass below No. 3 and the other above it. Cross the two threads between 3 and 2 in such a manner that two successive threads will not run in the same direction; they should always cross each other.

Pass the threads round both sides of peg No. 1 and repeat the process until the required number of threads has been placed on the warp frame.

In order to facilitate the process, the two threads are held in one hand with the index finger separating them. Care should also be taken not to hold the threads stretched too taut, but to keep the tension the same throughout. The threads on one side of the crossing are counted and should be equal to half the number required.

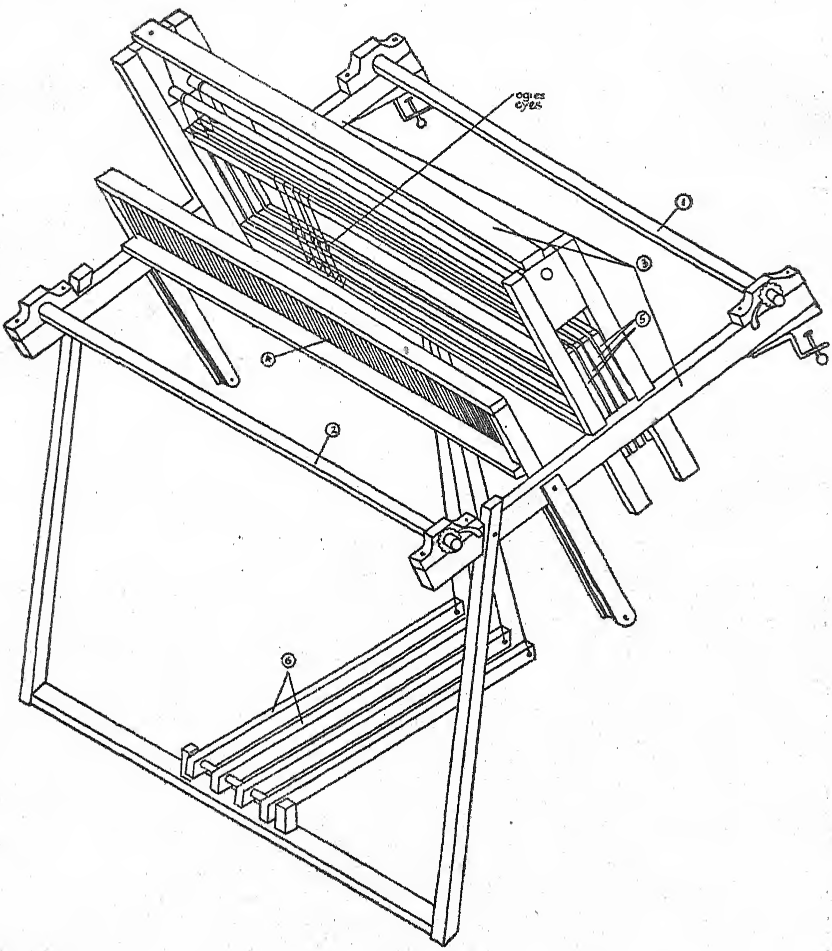
Once the warping has been completed, the warp must be prepared for transfer to the loom. Place two sticks (the length of which must be equal to the width of the loom) through the cross at B [Fig. 1 (*b*)] and tie them together so that the cross is retained. Take the rod from the back roller of the loom and push this through the warp at peg 15. Tie a string approximately 38 inches long to the upper end of the rod, pass it through the warp at peg 14 and fasten the end to the lower end of the rod. The cross at A will now be between the rod and the string. [Fig. 1 (*c*).]

Pass a stick through the warp at peg No. 1 and carefully remove the warp from the pegs. Place the warp on a table and spread it out to a width of 33 inches. Carefully roll up the warp in paper, starting from the side of the rod, until approximately 38 inches remain. (See Fig. 2.) Tie the roll at both ends. The warp is now ready to be transferred to the loom.

The Loom.

Before discussing the transfer of the warp to the loom, the various parts of the latter will be described. (See Fig. 2.)

A loom consists of the following parts: (1) Warp roller, (2) cloth roller, (3) frame, (4) reed, (5) heddles or shafts having a large number of eyes, and (6) treadles.



The Loom.

The loom shown in the illustration is a portable model capable of weaving cloth up to a width of 32 inches. The principle on which it operates, as well as the parts and the names of the parts, however, correspond to those of the larger looms.

Transferring the Warp to the Loom.

Place the rolled-up warp behind the loom on the table. Tie the rods holding the cross on top of the side bars of the loom, between the warp roll and the shafts. Cut the loop ends of the warp and draw the ends through the eyes in the shafts.

The order in which the threads are drawn through the shafts depends on the pattern to be woven.

For plain weaving the threads are drawn through the eyes in the 1st, 2nd, 3rd and 4th shafts alternately. The fifth thread is again drawn through an eye in the first shaft, and the process is repeated until all the threads have been drawn.

The shafts are then numbered from front to back 1, 2, 3, 4. Pass the hook through an eye in the 1st shaft, then take two threads from the right side of the warp, hook these on to the drawing hook and draw them through the eye. Only the first two and the last two eyes are threaded with a double thread in order to form a strong selvedge. Then pass the hook through an eye in the second shaft and draw the next thread through. Continue drawing the threads through the eyes in the shafts as described.

The cross in the warp at B, secured by the sticks at the back of the loom, helps one to draw the threads in the correct order. It will be noticed that one thread passes over the top of the stick and the next underneath it. The work will be facilitated if one person hands the threads from the back, while another does the drawing.

Draw all the threads as described, and remember that the two last threads are drawn through one eye in the shaft.

When all the threads have been drawn through the shafts, the next step is to draw them through the reed in the same order. The threads should not cross each other. For the blanket one thread is passed through each slit.

First of all, the width of the reed should be measured. From this width deduct the width of the warp and divide the result by two; this will give the distance from the right side of the reed, at which the drawing of the threads should commence.

Take a bundle of the warp threads in the left hand. Now select the first thread (which will be double) and place it on the outside of the fourth finger on the right hand. Then select the second thread and hold it between the 3rd and 4th fingers. The third thread comes between the 2nd and 3rd fingers and the fourth thread between the 1st and 2nd fingers. Make quite sure that the four threads come in the correct order and do not cross. The threads are now transferred to the left hand, the first thread being held between the thumb and index finger, the second between the index finger and the second finger, the third between the 2nd and 3rd fingers, and the fourth between the 3rd and 4th fingers. Hook the threads, one by one, through successive slits in the reed. Select the next four threads and draw these through again. Continue in this way until all the threads have been laced. Care should be taken not to miss a slit or to pass two threads through one slit with the exception of the first two and last two threads which are drawn through to form the selvedge.

When all the threads have been drawn, the warp at the back of the loom is untied and unrolled. One person then holds the warp, holding the rod at A, and another carefully draws the warp threads from the front through the shafts and the reed. Be careful not to break any threads. Draw the warp forward until the rod is up against the warp roller. Spread the warp threads evenly on the rod and nail the rod to the warp roller. It should be rolled up to a length of 2 inches only.

Comb the warp with the fingers of one hand, while holding it with the other. This helps to equalize the tension of all the threads. Pull the warp taut and roll it on the roller. Paper, slightly wider than the warp, is then placed over the threads and rolled up together with the warp; this helps to keep the tension uniform. Comb out every 3 to 4 feet, then roll up until the warp threads are 2 or 3 inches from the cloth roller.

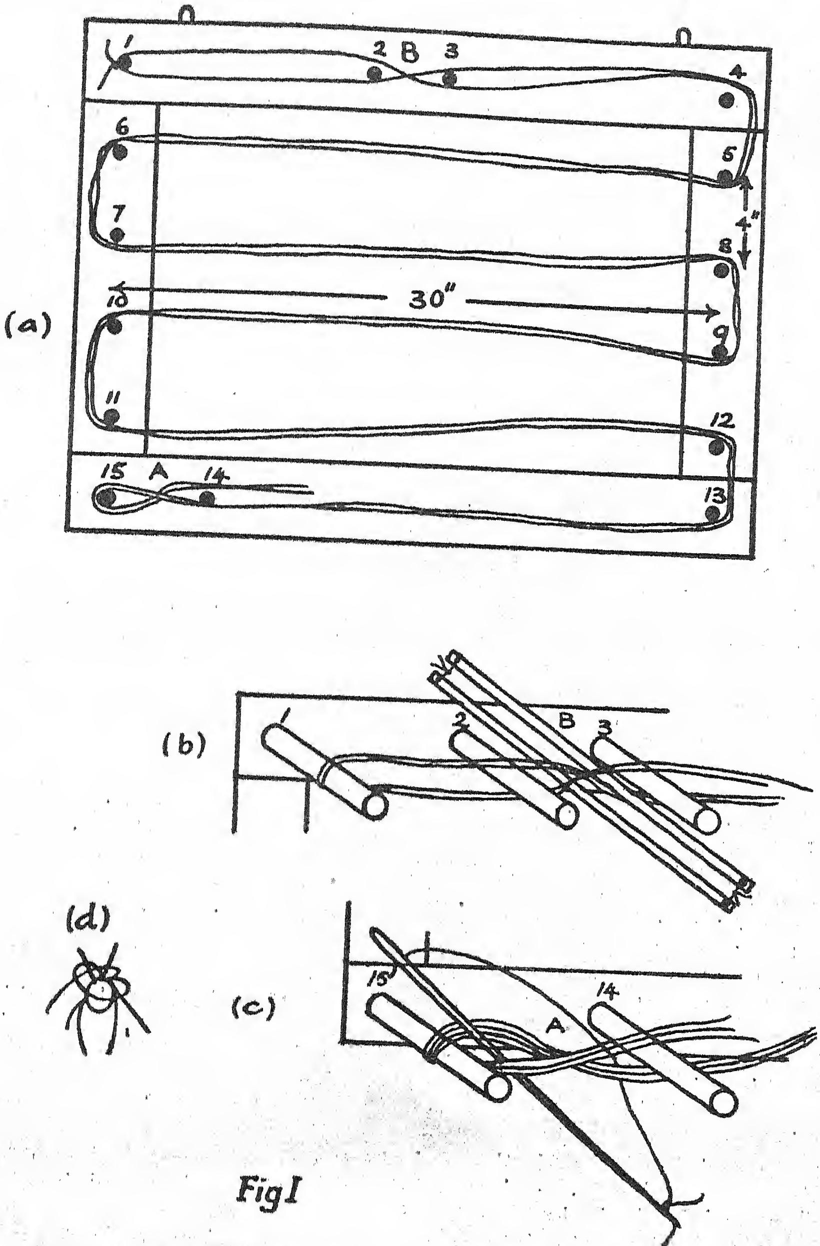


Fig I

Some looms have grooves in the cloth roller. Bundles consisting of 3 to 4 threads, or sometimes more, are drawn through the grooves and then tied together in two's in a single knot. Care should be taken in the first place to ensure that all the threads have the same tension before the second knot is tied.

In some looms a rod is tied to the front or cloth roller.

A small bundle of threads should then be taken on the right side, pulled to obtain the correct tension, and tied to the rod. Also tie a small bundle on the left side. The correct method of tieing the threads is as follows: Pass the bundle of threads underneath and then over the rod. Divide the threads into two groups and cross

these below the bundle of warp threads. Pull the threads taut and tie them at the top in a single knot. This is a useful method since all the threads can be tied with the same tension before the second knot is made.

After the bundles have been tied on the right and the left side, the other warp threads are all tied on the rod, from right to left. When all the threads have been tied as evenly as possible, the second knot is tied. In order to make the second knot, the ends are all taken and drawn together in the direction of the reed, the first knot being gradually tightened all the time and again slowly brought back against the rod; the second knot is then tied as close to the rod as possible. This second knot often has to be retied several times before all the threads have the same tension. It is impossible to lay too much stress on the importance and necessity of an absolutely even tension.

Unless the warp threads are uniformly taut, it will be impossible to turn out a good piece of material. The threads will break continually, and no clear shed will be obtained, or otherwise the threads will bulge.

The blanket may be done in plain weaving, which appears similar to darning, or in twill weaving. Twill weaving yields a softer texture than plain weaving, but the latter yields a more compact weave. Plain weaving will be described first.

When the knots in the warp have been tied, the treadles are attached. For plain weaving the middle treadle on the left is attached to the first shaft. The same treadle is tied to the third shaft with a second piece of string. Attach the treadle on the right to the second and fourth shafts with two separate pieces of string.

The Weft.

The weft threads are inserted by means of a shuttle. Wind the wool on the bobbin of the shuttle—a special bobbin winder is used for this purpose. If this is not available, a spinning wheel may be used. Cut a peg approximately 6 inches long, which will fit exactly into the hole of the spindle of the spinning wheel. Attach a bobbin to the end of the peg and wind the wool by operating the treadle of the spinning wheel.

The thread should first be wound on half an inch of the bobbin, then on the next half inch and so on until the bobbin is full. The bobbin should, however, not be filled like that of an ordinary sewing machine, i.e. row by row in the entire length.

Before inserting the weft, care should be taken to have the warp lying perfectly straight from the warp roller to the cloth roller. Also make certain that each thread is in the correct eye of the shafts. Everything will now be in readiness to start weaving a plain piece of material. This is done by simply interlacing woof and warp threads, the two sets of threads crossing each other at right angles and alternately passing over and under each other as in an ordinary piece of darning.

Push the reed back against the shafts. Press down the treadles on the left with the foot, and all the threads passing through eyes in the 1st and 3rd shafts will be lowered so that the warp threads will be divided into two equal sets. The opening between the top and lower warp threads is known as the " shed ". The shuttle holding the wool is shot through this opening with the left hand and caught on the other side with the right. Press the reed against the woof thread just inserted: this process is known as " beating up " the woof. Then push the reed back against the shafts and press down

the treadle on the right so that the warp threads are again divided in half. Shoot the shuttle holding the wool back through the shed from right to left, catching it on the other side with the left hand. Care should be taken not to pull the woof too tightly, otherwise the selvedge will be pulled in. The selvedge should always be kept straight; no loops should be allowed, nor should the selvedge curve inwards. Beat up again by pushing the reed against the weft. Care should be taken to beat up all the woof threads equally tightly, otherwise the cloth will be thick in certain places and thin in others.

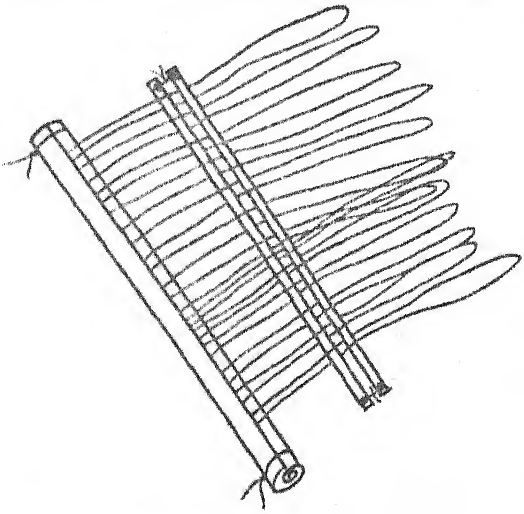


Fig II

Continue weaving until the woven material has been brought so close to the reed that, should the process be continued any further, difficulty will be experienced in passing the shuttle or weft stick through the shed. The warp roller should then be loosened, a few inches of warp unrolled and the roller refastened. Turn the cloth roller sufficiently to take up the additional length, and refasten. Then continue weaving.

When the woof thread has been used up, more wool is wound on to the bobbin. Press down the two shafts which are to be used next, and draw the end of the old weft thread into the shed, then upwards between two of the warp threads until it rests on the surface of the woven material. Then shoot the shuttle through the shed, catch the end of the new weft and pull this upwards between two of the warp threads as well so that it comes to lie on the surface of the woven material. This should be done in such a way that the two ends overlap over a width of approximately three warp threads. After weaving approximately another inch, the two ends may safely be cut close to the surface of the material, leaving practically no mark to show where the threads crossed or were cut off. In the case of thick wool, however, this cannot be done.

The warp should be kept taut since this will facilitate the weaving process. When a thread breaks, it should be mended immediately. This is always done by means of a weaver's knot which is tied as follows: Hold the end of the broken thread between the thumb and forefinger of the left hand. With the right hand pass the end of the new thread behind the broken one, holding both so

tightly that the two ends stand practically upright in the left hand. The end of the new thread will now be on the left and that of the broken thread on the right. With the right hand the end of the new thread is brought across the thumb of the left hand, behind the left end, then forward again between the two upright ends. This leaves a small loop on the thumb-nail of the left hand. [Fig. 1 (*d*).] While the threads are tightly held, the left end is pushed back across the forefinger of the left hand and held there firmly with the middle finger. It must not be allowed to slip. With the right hand, the right end is brought forward, slipped under the loop on the left thumb and, as in the case of the left end, firmly held under the middle finger of the left hand. The new thread should then be pulled; this will tighten the loop. Both ends should be held firmly until the loop has been drawn tight. The two ends should then be cut off fairly close to the knot.

When a thread is mended in this way, care should be taken to ensure that it is not twisted around any other threads. Thread it through the empty eye in the shaft, through the vacant opening in the reed and pin it to the cloth at a point exactly opposite the opening in the reed through which the new thread has been passed. Disregard the broken end which is attached to the woven material and merely pull it down so that it hangs loose under the cloth. When the cloth is removed from the loom, it will probably be necessary to darn the loose ends into the material, but if the cloth is of a very fine texture, they may simply be cut off.

When the required length has been woven, the warp is cut off 2 or 3 inches behind the last woof thread. The warp threads are tied together into bundles to prevent unravelling in the finishing process. Unroll the cloth roller and pull the warp threads out of the grooves, or untie the knots.

Examine the cloth carefully. Any loose ends should be darned in or cut off and, should any warp or weft threads be missing, they should be darned in.

The Twill Weaving Process.

If a blanket is preferred in a twill weave, the treadles should be attached as follows. First they are marked 1, 2, 3, 4, from right to left. Attach the first and second shafts to the 1st treadle, the second and third to the 2nd treadle, the third and fourth shafts to the 3rd treadle and the fourth and first shafts to the 4th treadle. For twill weaving the treadles are pressed down in the order 1, 2, 3, 4.

For this type of weaving it is essential that the first woof thread be inserted from the left, otherwise loose threads will occur in the selvedge. Twill weaving beats up more readily. Consequently, care should be taken that the threads are not beaten up too tightly. The warp threads should show up almost as much as the woof threads.

For the rest, the same rules apply as for plain weaving.

When the weaving of the blanket has been completed, the cloth is cut into two and the halves sewn together lengthwise.

Finishing.

Steep the blanket in a solution of soap and ammonia for half an hour. Then wash it by kneading it in a bath containing soapy water. Rinse well and hang up. Before the blanket has dried completely, it is brushed with wool combs to make it woolly. The more it is brushed, the lighter and warmer the blanket will be.

The loose threads in the blanket may then be cut of, and the sides hemmed in blanket stitch.

Crops and Markets

A Statistical and Economic Review of South African Agriculture

by

The Division of Economics and Markets

Vol. 20 AUGUST, 1942 No. 240

CONTENTS

Price Review for June 1942.*

SLAUGHTER CATTLE.—Bigger supplies came on the market during June. On the whole the offerings were of poor quality and consisted mostly of compound cattle. Nevertheless the demand was stable and prices for all classes again rose, e.g., on the Johannesburg market ordinary primes rose from 51s. 3d. per 100 lb. estimated dressed weight *on the hook* to 53s. 8d. in June, good mediums from 47s. 5d. to 49s. 8 d.and compounds from 36s. 8d. to 39s. 5d., while on the Durban market medium cattle rose from 35s. 11d. per 100 lb. dressed weight on the hook to 37s. 1d. in June and compounds from 26s. to 28s. 6d.

Slaughter Sheep.—Bigger supplies consisting mainly of merinos and lambs came on the markets. Crossbreds were relatively scarce. The quality on the whole was good, the demand strong and prices as a result again rose, viz., prime merinos on the Johannesburg market from 9·1d. per lb. estimated dressed weight on the hoof to 9·7d. in June, medium merinos from 7·9d to 8·2d., while on the Cape Town market the increases for prime and medium merinos were respectively 9·0d. per lb. to 9·4d. and 8·3d. to 8·8d.

Pigs.—Bigger supplies came on the market during June. Baconers and porkers of which a good proportion were primes, constituted the majority. The demand was good and competition keen with the result that price increases also occurred here, thus porkers on the Johannesburg market rose from 5·0d. per lb. liveweight in May to 5·5d. in June and baconers from 7·8d. to 8·0d.

Feeds.—The scarcity of feeds of all kinds continued and prices again rose, viz., Cape lucerne hay on the Johannesburg market from 7s. 6d. per 100 lb. in May to 8s. 1d. in June, Transvaal lucerne hay from 6s. 11d. to 7s. 7d. and Cape No. 1 on the Cape Town market from 6s. 7d. to 7s. 9d., while teff hay on the Johannesburg market

*All prices mentioned are averages.

rose from 6s. 6d. to 7s. 4d. per 100 lb. (In this connection see also article on the fixing of maximum prices for lucerne hay, teff hay and lucerne meal elsewhere in this issue.)

Kaffircorn.—Kaffircorn also showed a further advance during the month, viz., from 20s. 8d. in May to 21s. 11d. per bag f.o.r. producer's stations for K 1 and K 2.

Potatoes.—The markets everywhere were moderately supplied except the Cape Town market which at one time was very heavily supplied with local potatoes of poor quality and which caused prices to decline so that the average price for Cape No. 1 for June was 17s. 10d. per bag as against 20s. 2d. in May. On the other markets, however, prices in most cases rose. On the Johannesburg market, for example, Transvaal No. 1 was 17s. 10d. per bag in June as against 15s. 11d. the previous month and National Mark Grade 1 Nos. 2 and 3 were 22s. 3d. as against 21s. 7d. and 22s. 10d. as against 21s. 11d. respectively, while on the Durban market Natal No. 1 advanced from 18s. 7d. to 20s. 4d. in June.

Onions.—On the whole, small supplies consisting mainly of Cape onions were present on the markets and prices were generally higher than the previous month. Cape onions on the Johannesburg market were 14s. 6d. per bag in June as against 20s. 10d. in May, Transvaal onions 14s. 0d. as against 11s. 9d. and Cape onions on the Cape Town market were 11s. 7d. as against 10s. 10d. in May.

Vegetables.—Somewhat larger supplies than the previous month were present on the markets, especially as the result of bigger consignments of cabbage, cauliflower and green peas. Especially the Johannesburg and Pretoria markets were very well supplied from the Transvaal Lowveld. The price level for all kinds of vegetables, however, remained firm as a result of a good demand.

Tomatoes.—Lowveld tomatoes were present on all markets and prices declined everywhere, exceptionally sharp on some markets. On the Johannesburg market, e.g., prices of National Mark tomatoes declined from 3s. 11d. per tray in May to 2s. 8d. in June and ordinary from 2s. 4d. to 1s. 5d. On the Cape Town and Durban markets the declines were from 2s. 10s. to 2s. 5d. and from 1s. 7d. to 1s. 4d. respectively.

Fruit.—Supplies of decidous fruit gradually declined, only apples from cold storages were present in fairly large quantities.

As is common for this time of the year, naval oranges were the most important fruit and notwithstanding heavy offerings on some markets, prices on the whole remained firm. For example, 2s. 3d. per pocket on the Johannesburg market and 2s. 1d. and 2s. 6d. per pocket on the Cape Town and Durban markets respectively.

As regards tropical fruit, the markets were moderately supplied with pineapples, guavas and pawpaws, while avocado pears were rapidly disappearing during the month.

Eggs.—Somewhat larger supplies entered the trade, neverthe-less, prices changed little or nothing since the previous month, except on the Cape Town market, where as a result of a small supply and sharper demand, prices rose from 18s. 11d. per hundred in May to 22s. 7d. in June. New-laid eggs per dozen on the Johannesburg market were 2s. 6d. and on the Durban market 2s. 10d.

Index of Prices of Field Crops and Animal Products.

As mentioned elsewhere in this issue, this index again rose during the past month, viz., from 136 in May to 138 in June. As regards the respective groups of products, that of summer cereals and winter cereals, pastoral products and dairy products changed little or nothing. Hay again rose sharply, viz., from 188 to 207 while the group "other field crops" rose from 181 to 186 owing to increases in the prices of potatoes and onions. The increase in the index of slaughter stock which commenced in May continued and for June it was 140 as against 132 the previous month. The group "Poultry and poultry produce" also advanced further from 203 to 218 in June, mainly as a result of a rise in prices of eggs on the Cape Town market.

Maximum Prices Fixed for Lucerne Hay and Teff Hay.

IN view of the present scarcity of feeding stuffs, the Price Controller has fixed the following maximum prices, as announced in the *Government Gazette Extraordinary* of 3rd July 1942, at which lucerne and teff hay and lucerne meal may be sold. In each case it is the maximum price per 100 lbs. free-on-rail seller's station:—

Lucerne Hay, dried in bales: 6s.
Teff Hay, dried in bales: 5s.
Lucerne Meal in bags: 9s. 9d.

The latter price is free-on-rail miller's station,

Although the past season's production was not much below that of the previous season, the demand, as a result of the drought was exceptionally large, so that supplies proved inadequate and prices rose abnormally high. Production of teff hay, however, was below normal as a result of the damage done by the drought and army worm.

Average Prices of Maize, Kaffir-corn and Dry Beans per 200 lb.

Season and Month.	Maize. F.o.r. Producers' Stations. No. 2. Bags.	Maize. F.o.r. Producers' Stations. No. 2. Ex Elevator.	Maize. F.o.r. Producers' Stations. No. 6. Bags.	Maize. F.o.r. Producers' Stations. No. 6. Ex Elevator.	Maize. Cape Town Consumers' Price F.o.r. No. 6 in Bags.	Kaffircorn F.o.r. Producers' Stations. Bags, K. 1.	Kaffircorn F.o.r. Producers' Stations. Bags, K. 2.	Dry Beans Johannesburg (Municipal Market). Speckled Sugar.	Dry Beans Johannesburg (Municipal Market). Cow Peas.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
1938–39	8 7	8 6	8 6	8 8	13 2	13 1	12 9	25 0	16 9
1940–41	9 2	8 8	9 3	8 9	14 0	15 6	17 0	30 0	16 8
1941—									
January	9 9	8 11	9 9	9 0	14 1	24 3	23 0	35 3	14 11
April	10 3	9 8	10 8	10 0	14 11	14 3	15 8	33 2	18 6
July	9 3	—	9 1	—	13 7	17 4	17 10	34 8	21 9
October	10 10	9 11	9 10	8 10	13 11	17 3	18 1	34 6	20 10
1942—									
January	11 0	10 1	10 10	9 4	14 9	21 5	22 3	34 4	21 9
February	11 0	—	11 0	—	14 8	21 11	22 11	32 7	20 11
March	10 6	—	10 6	—	14 9	20 2	21 1	30 10	19 2
April	10 6	—	10 6	—	14 10	18 5	18 9	32 6	25 5
May	15 0	—	15 0	—	15 6	20 8	20 8	32 8	26 4
June	15 0	—	15 0	—	17 6	21 11	21 11	33 5	26 5

Seasonal year for maize and kaffircorn, 1st June–31st May; for dry beans, 1st April–31st March.

Index of Prices of Field Crops and Animal Products.

(Basic period 1936-37 to 1938-39=100.)

SEASON (1st July to 30th June).	Summer Cereals, (a)	Winter Cereals. (b)	Hay. (c)	Other Field Crops. (d)	Pastoral Products. (e)	Dairy Products. (f)	Slaughter Stock. (g)	Poultry and Poultry Products. (h)	Combined Index.
WEIGHTS.	19	13	2	3	34	6	17	6	100
1936-37.........	118	86	94	93	122	86	89	98	106
1937-38.........	89	106	112	118	98	112	105	107	101
1938-39.........	92	107	96	89	79	102	106	94	93
1939-40.........	86	106	77	93	116	105	106	89	104
1940-41.........	109	113	106	159	103	108	110	112	109
1941-									
January.......	121	115	98	121	100	104	115	96	109
February......	122	115	92	115	100	104	112	107	109
March.........	135	115	87	125	100	104	105	125	112
April..........	126	116	98	167	101	106	108	151	114
May...........	112	116	125	160	101	109	108	157	112
June..........	110	116	126	183	101	111	111	150	113
July...........	112	118	128	241	100	130	118	145	117
August........	111	118	132	216	100	130	119	109	114
September.....	118	118	154	228	100	130	128	108	118
October........	124	119	138	268	100	128	135	115	121
November.....	124	137	110	250	100	128	140	118	124
December......	127	137	135	199	100	122	147	128	125
1942—									
January.......	131	137	126	180	100	122	144	141	125
February......	132	138	125	168	101	130	140	147	125
March.........	126	140	140	175	101	130	134	168	125
April..........	126	139	151	170	102	130	129	175	125
May...........	158	139	188	181	102	154	132	203	136
June..........	159	139	207	186	101	154	140	218	138

(a) Maize and kaffircorn.
(b) Wheat, oats and rye.
(c) Lucerne and teff hay.
(d) Potatoes, sweet potatoes, onions and dried beans.
(e) Wool, mohair, hides and skins
(f) Butterfat, cheese milk and condensing milk.
(g) Cattle, sheep and pigs.
(h) Fowls, turkeys and eggs.

Average Prices of Oranges and Pawpaws on Municipal Markets.

SEASON (1st April to 31st March).	ORANGES (Pocket).							PAWPAWS (Standard box).	
	Johannesburg.			Cape Town.		Durban.		Johannesburg.	
	N.M. Navels.	Other.							
		Navels.	Valencias.	Navels.	Valencias.	Navels.	Valencias.	N.M.	Other.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
1938-39..........	1 10	1 6	1 5	2 0	2 1	—	—	2 0	1 7
1940-41..........	1 9	1 7	1 6	1 11	1 10	2 4	2 1	2 2	1 9
1941—									
January........	—	0 11	1 9	—	1 10	—	2 11	2 6	1 6
February.......	—	2 2	2 2	—	2 9	—	—	3 7	2 10
March..........	—	2 3	2 10	3 0	2 9	2 9	—	3 5	2 7
April...........	1 9	1 8	1 5	2 5	1 11	2 1	—	2 7	2 1
May............	1 9	1 5	1 4	1 7	1 0	2 2	—	2 0	1 6
June...........	1 8	1 6	1 3	1 7	—	1 8	—	1 6	1 4
July............	1 8	1 7	1 3	1 8	—	1 11	1 6	1 5	1 2
August.........	2 2	2 2	1 7	1 11	1 6	1 10	1 8	1 11	1 8
September......	2 4	2 1	1 9	2 4	1 8	2 6	1 8	1 9	1 5
October.........	—	1 10	1 11	3 2	1 9	3 5	1 8	2 3	1 10
November......	—	2 9	2 8	3 1	2 7	—	2 5	3 2	2 6
December......	—	2 9	3 6	—	3 5	—	2 6	3 9	2 7
1942—									
January........	—	2 6	3 8	2 10	4 7	—	3 11	3 3	2 1
February.......	—	3 11	4 5	4 7	6 10	3 9	5 8	6 4	3 3
March..........	—	3 7	2 11	6 6	5 10	4 3	5 6	4 1	3 1
April...........	2 1	2 0	1 10	3 4	5 0	3 4	2 6	4 0	3 1
May............	2 4	2 3	2 1	2 3	2 3	2 6	1 2	3 8	3 1
June...........	2 3	2 3	1 9	2 1	—	2 6	1 11	2 11	2 5

Average Prices of Potatoes and Onions on Municipal Markets.

Season (1st July to 30th June).	Potatoes (150 lb.). Johannesburg. Transvaal. No. 1.	Potatoes (150 lb.). Johannesburg. Transvaal No. 2.	Potatoes (150 lb.). Johannesburg. N.M. Grade 1. No. 2.	Potatoes (150 lb.). Johannesburg. N.M. Grade 1. No. 3.	Potatoes (150 lb.). Cape Town. Cape No. 1.	Potatoes (150 lb.). Durban. Natal No. 1.	Onions (120 lb.). Johannesburg. Transvaal.	Onions (120 lb.). Johannesburg. Cape.	Onions (120 lb.). Cape Town. Cape.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
1938–39	6 9	6 2	8 10	8 1	8 3	8 10	8 3	8 10	7 4
1940–41	14 2	13 4	18 6	18 5	15 7	16 10	12 5	12 3	9 10
1941—									
January	11 4	10 1	12 4	11 7	10 2	14 4	7 3	7 3	4 7
February	8 9	8 2	12 1	11 9	14 2	11 0	6 9	7 4	4 10
March	10 10	10 7	13 9	13 8	13 0	13 5	8 1	8 10	5 4
April	14 8	14 10	19 9	19 0	19 4	17 11	8 11	9 9	7 8
May	15 3	14 4	21 1	20 11	16 9	17 11	9 9	10 3	7 6
June	17 9	17 10	22 10	22 7	18 2	21 4	10 8	13 2	9 5
July	22 9	23 5	28 0	28 5	26 8	27 6	16 1	16 1	12 11
August	18 10	19 10	26 10	27 2	24 8	24 9	13 0	19 0	15 3
September	19 2	20 1	25 1	24 8	28 0	26 7	17 1	16 9	13 9
October	26 0	24 10	28 8	28 8	33 5	29 8	11 3	17 1	12 11
November	25 0	24 3	34 1	32 11	26 10	29 8	9 1	—	10 1
December	21 5	20 1	22 2	21 11	14 9	24 8	10 3	12 4	8 1
1942—									
January	18 8	16 4	20 6	18 11	15 3	23 2	9 3	10 2	7 10
February	15 9	13 11	20 11	20 5	16 3	20 3	9 10	9 9	7 0
March	16 6	15 2	21 4	21 7	18 4	21 3	8 9	9 5	6 7
April	14 6	13 4	21 1	21 2	19 9	18 2	11 9	12 10	7 6
May	15 11	16 1	21 7	21 11	20 2	18 7	11 9	12 10	10 10
June	17 10	17 6	22 3	22 10	17 10	20 4	14 0	14 6	11 7

Average Prices of Green Beans, Green Peas and Carrots on Municipal Markets.

Season (1st July to 30th June).	Green Beans (Pocket 20 lb.). Johannesburg.	Green Beans (Pocket 20 lb.). Cape Town.	Green Beans (Pocket 20 lb.). Durban.	Green Peas (Pocket 20 lb.). Johannesburg.	Green Peas (Pocket 20 lb.). Cape Town.	Green Peas (Pocket 20 lb.). Durban.	Carrots (Bag). (a) Johannesburg.	Carrots (Bag). (a) Cape Town.	Carrots (Bag). (a) Durban.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
1938–39	1 8	2 3	2 0	2 4	1 9	1 2	3 8	2 6	6 1
1940–41	1 11	2 9	1 5	2 8	2 4	2 3	5 9	4 11	13 4
1941—									
January	1 5	—	1 3	2 11	2 8	2 9	4 8	2 1	5 5
February	1 9	1 9	1 7	2 9	—	2 6	7 11	3 0	15 1
March	1 6	1 8	1 5	3 7	4 8	2 9	9 2	3 2	13 7
April	1 10	2 5	0 9	2 9	2 8	2 9	8 7	3 8	19 5
May	1 5	2 4	1 5	3 4	3 2	1 10	6 7	5 8	13 9
June	3 0	3 5	2 11	4 6	3 6	2 2	6 4	9 0	13 3
July	6 4	6 0	6 11	6 6	3 9	5 1	8 5	9 9	10 11
August	3 0	3 7	3 10	3 6	3 0	3 8	10 4	11 6	16 8
September	2 9	4 6	3 1	3 4	3 3	2 1	8 10	9 0	12 2
October	2 0	3 9	1 9	2 5	2 0	3 6	6 4	7 1	12 10
November	2 1	3 5	1 5	4 0	2 6	4 3	7 6	7 10	8 8
December	3 1	1 7	2 2	7 2	3 9	4 2	7 6	6 1	12 3
1942—									
January	2 4	0 8	3 1	6 4	—	4 8	5 9	7 8	11 6
February	2 1	1 4	1 7	2 6	—	2 7	10 0	11 6	19 1
March	1 10	2 1	2 2	3 2	2 0	3 6	12 11	10 6	24 7
April	1 6	3 0	1 5	3 3	5 0	2 10	13 5	9 7	29 7
May	2 6	3 3	1 10	4 9	3 8	2 9	9 2	9 8	19 10
June	3 7	2 10	2 4	4 6	5 11	2 10	5 5	11 0	13 2

(a) Weights of bags vary, but on the average are approximately as follows:—Johannesburg, 130 lb.; Cape Town, 90 lb.; and Durban, 120 lb.

Average Prices of Slaughter Cattle and Pigs.

Season (1st June to 31st May).	Beef per 100 lb.						Pigs per lb. Live Weight.		
	(a) Johannesburg.				(b) Durban.		Johannesburg.		
	N.M. Prime.	Ordinary. Prime.	Good Medium.	Com-pounds.	Medium.	Com-pound.	Porkers, Prime.	Baconers, Prime.	Stores.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	d.	d.	d.
1938–39	41 9	39 0	36 3	31 7	33 0	27 4	5·3	6·2	4·9
1940–41	43 11	41 4	37 11	32 5	31 1	25 4	4·5	5·4	4·0
1941—									
January	45 7	42 11	39 6	34 7	32 2	27 7	4·8	5·7	4·0
February	45 0	41 2	38 1	32 9	29 11	24 5	4·3	6·2	4·1
M rch	40 6	38 3	35 5	29 7	27 11	21 4	4·2	6·1	3·6
April	42 4	39 10	36 3	30 1	29 10	25 5	4·2	5·6	3·8
May	44 6	40 8	36 10	30 9	29 4	22 1	4·2	5·6	3·9
June	43 9	41 2	37 6	32 8	32 2	25 9	4·3	5·4	3·7
July	46 5	44 5	39 10	33 5	34 6	29 11	4·6	5·6	4·0
August	47 0	44 9	41 2	33 7	35 5	29 3	4·5	5·6	3·5
September	49 11	47 1	44 2	36 11	41 9	33 11	4·8	5·6	3·7
October	56 5	53 6	50 1	44 11	46 1	34 8	5·0	5·6	4·2
November	68 4	63 2	55 5	42 8	51 4	36 4	5·5	6·2	4·8
December	72 2	68 7	60 3	43 0	49 2	33 6	5·4	6·4	4·9
1942—									
January	63 2	59 6	54 1	43 5	45 1	29 3	5·6	7·0	5·6
February	58 3	53 4	49 2	40 6	38 11	26 7	5·4	8·0	5·2
March	53 5	47 10	44 3	36 11	37 8	27 11	5·5	8·2	4·8
April	53 0	49 10	44 4	35 6	37 3	28 5	5·5	8·2	4·7
May	54 4	51 3	47 5	36 8	35 11	26 0	5·0	7·8	4·6
June	56 6	53 8	49 8	39 5	37 1	28 6	5·5	8·0	5·1

(a) Estimated dressed weight of cattle as sold on the hoof. As reported by Meat Contro Board.
(b) Dressed weight of carcase sold on the hook.

Average Prices of Sheep per lb. Estimated Dressed Weight.*

Season (1st June to 31st May).	Johannesburg.				Cape Town.			
	Merino Wethers.		Persians and Cross Breds.		Merinos.		Capes and Persians.	
	Prime.	Medium.	Prime.	Medium.	Prime.	Medium.	Prime.	Medium.
	d.	d.	d.	d.	d.	d.	d.	d.
1938–39	6·3	5·5	5·8	5·1	5·8	5·6	5·9	5·7
1940–41	6·7	6·1	6·2	5·7	6·1	5·8	6·3	6·0
1941—								
January	7·0	6·5	6·5	6·0	6·3	6·1	6·4	6·1
February	7·1	6·6	6·7	6·2	6·9	6·5	6·8	6·5
March	6·7	6·1	6·2	5·7	6·3	5·9	6·2	5·9
April	7·0	6·5	6·4	5·9	6·6	6·1	6·4	6·1
May	7·1	6·5	6·6	6·0	6·0	5·8	6·3	6·0
June	7·1	6·6	6·6	6·1	6·3	5·9	6·5	6·2
July	7·7	7·0	7·2	6·6	7·0	6·7	6·9	6·6
August	7·6	7·0	7·1	6·5	7·1	6·7	6·8	6·6
September	8·2	7·6	7·7	7·0	7·2	6·8	7·2	6·9
October	7·4	6·7	7·0	6·3	6·6	6·4	6·8	6·6
November	7·4	6·8	6·9	6·3	6·8	6·5	6·9	6·6
December	8·2	7·4	7·6	6·8	6·8	6·5	6·8	6·5
1942—								
January	8·7	7·8	7·5	6·7	7·4	7·1	7·4	7·2
February	9·3	8·3	8·2	7·7	9·0	8·3	8·7	8·3
March	9·6	8·4	8·8	7·9	9·6	8·8	9·3	8·8
April	8·8	7·7	7·9	6·9	9·7	8·8	9·4	8·8
May	9·1	7·9	8·1	6·9	9·0	8·3	9·0	8·4
June	9·7	8·2	8·6	7·3	9·4	8·8	9·6	8·7

* As sold on the hoof. Reported by Meat Control Board.

Average Prices of Eggs on Municipal Markets and Prices of Hides and Skins.

Season (1st July to 30th June).	Eggs.				Hides (per lb.).		Skins.		
	Johannesburg.		Cape Town, per 100.	Durban New Laid, per dozen.	Port Elizabeth.		Port Elizabeth.		
	New Laid, per dozen.	Fresh, per dozen.			1st Grade, Sun-dried.	1st Grade, Dry Salted.	Merino. Medium, per lb.	Merino. Combings, per lb.	Glovers, Sound, per lb.
	s. d.	s. d.	s. d.	s. d.	d.	d.	d.	d.	s. d.
1938–39	1 0	0 9	7 11	1 1	6·0	5·3	4·1	5·7	2 9
1940–41	1 1	0 10	8 3	1 3	5·8	6·0	4·9	7·6	2 10
1941—									
January	1 1	0 9	9 3	1 3	5·9	6·3	4·7	7·3	3 1
February	1 4	1 0	9 2	1 7	5·7	5·9	4·4	8·2	3 1
March	1 8	1 3	11 10	1 10	5·4	5·8	5·0	8·9	3 2
April	2 1	1 7	13 8	2 6	6·3	6·9	6·2	9·1	3 5
May	1 11	1 6	15 8	2 7	6·5	6·8	6·3	8·7	4 0
June	1 8	1 5	14 9	2 0	6·5	6·8	6·1	8·6	4 3
July	1 6	1 4	14 0	1 10	6·3	6·8	4·3	7·8	4 2
August	1 0	0 11	8 9	1 1	6·5	6·6	4·4	8·0	4 2
September	1 0	0 11	8 5	1 1	6·5	6·8	4·4	8·1	4 1
October	1 0	0 11	8 10	1 2	6·8	7·0	3·8	7·7	4 0
November	1 1	1 0	9 1	1 4	7·0	7·1	4·3	7·7	4 1
December	1 5	1 2	9 10	1 9	7·3	7·3	4·0	7·8	4 2
1942—									
January	1 7	1 4	12 2	2 0	7·5	7·6	4·3	7·9	4 0
February	1 9	1 6	13 1	2 0	7·7	7·8	5·7	8·5	3 0
March	2 0	1 9	14 5	2 6	7·6	7·6	6·4	9·2	3 11
April	2 3	1 9	17 1	2 10	7·5	7·5	7·0	10·5	3 11
May	2 6	2 2	18 11	2 10	7·5	7·6	6·7	9·9	4 1
June	2 6	2 3	22 7	2 10	7·6	7·7	6·0	9·7	4 2

Average Prices of Apples, Pears and Grapes on Municipal Markets.

Season (1st July to 30th June).	Apples (Bushel box).						Pears (Bushel box).		Grapes (Tray).
	Johannesburg.			Cape Town.			Johannesburg.		Johannesburg.
	O'heni-muri.	White Winter Pear-main.	Wem-mers-hoek.	O'heni-muri.	White Winter Pear-main.	Wem-mers-hoek.	N.M. No. 1.	Other.	Johan-nesburg.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
1938–39	7 2	6 0	5 10	7 3	8 0	4 3	6 7	4 2	1 3
1940–41	8 4	7 1	6 4	8 11	10 8	5 7	8 11	6 3	1 8
1941—									
January	—	—	—	8 5	—	—	7 0	5 8	1 7
February	—	—	—	7 11	10 6	4 5	9 0	6 9	1 6
March	6 8	5 11	5 7	6 9	7 3	5 2	9 0	6 2	1 10
April	6 9	6 4	6 1	7 6	7 11	5 7	6 3	6 5	1 11
May	7 5	6 3	6 10	8 3	7 10	5 9	8 1	5 11	2 0
June	8 3	7 8	8 4	9 11	9 10	6 9	—	9 5	1 2
July	8 2	7 2	8 5	11 3	11 4	12 6	10 7	7 5	—
August	8 4	8 1	7 3	11 0	11 0	11 8	—	11 1	—
September	11 8	9 1	8 3	10 9	12 10	—	—	—	—
October	10 8	9 0	6 10	10 6	13 5	—	—	—	—
November	16 0	13 0	—	8 5	13 8	—	—	—	—
December	—	—	—	—	16 5	—	—	5 10	3 8
1942—									
January	—	—	—	—	—	—	—	7 5	3 2
February	8 3	—	12 2	8 10	—	—	7 3	7 8	1 6
March	7 5	6 11	7 6	7 7	9 3	6 3	5 6	7 0	1 10
April	8 6	7 6	6 8	7 9	9 8	6 2	—	9 6	1 11
May	8 10	7 7	6 5	8 9	9 7	5 6	—	8 11	2 0
June	10 1	8 10	8 4	9 7	10 9	6 3	—	15 9	2 5

Average Prices of Lucerne and Teff Hay and Certain Meals for Feeding.

SEASON (1st July–30th June).	LUCERNE (100 lb.). Johannesburg (a). Cape	Trans-vaal	Cape Town, Cape 1st Grade.	TEFF Johan-nesburg. (a) (100 lb.).	MEALS FOR FEEDING: F.o.r. Johannesburg. Lucerne. (100 lb.).	Monkey Nut Cake (200 lb.).	Oats, Sussex Ground (150 lb.).	Bone, 24·8% Protein (100 lb.).	Mixed, 26·4% Protein (100 lb.). (b)
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
1938–39	3 11	3 1	4 0	2 7	6 9	15 2	15 4	8 5	8 0
1940–41	4 2	3 5	4 3	3 3	6 7	15 3	14 8	11 2	8 7
1941—									
January	3 9	3 2	4 0	3 9	6 6	15 0	14 6	11 0	8 6
February	3 9	2 8	4 1	2 8	6 6	14 6	14 0	11 0	8 6
March	3 6	3 0	4 5	2 7	6 6	14 0	14 0	11 0	8 6
April	4 0	3 11	5 0	2 10	6 6	14 6	14 0	11 0	8 6
May	5 3	3 10	5 0	2 10	6 9	14 6	14 6	11 0	8 6
June	5 3	4 9	5 5	3 1	7 0	15 6	15 0	11 0	9 6
July	5 2	5 2	5 10	3 10	7 6	15 6	16 0	11 0	9 6
August	5 6	6 3	5 11	3 3	8 0	—	17 0	11 0	9 6
September	6 5	6 1	5 7	3 9	8 6	16 0	17 6	11 0	9 6
October	5 8	5 6	5 1	3 10	8 6	—	17 6	11 0	9 6
November	4 5	3 11	4 11	3 6	8 6	—	—	11 0	9 6
December	5 3	4 10	4 9	4 10	7 6	—	17 6	10 6	9 6
1942—									
January	4 10	4 7	5 1	4 11	7 6	—	17 6	10 6	10 3
February	4 11	4 8	5 5	4 4	7 6	—	17 6	10 6	10 3
March	5 4	4 11	5 7	5 6	8 6	—	17 6	11 0	10 3
April	5 8	5 6	5 9	6 4	8 6	—	17 6	11 0	10 3
May	7 5	6 11	6 7	6 6	9 6	—	18 0	11 0	15 9
June	8 1	7 7	7 9	7 4	9 6	—	18 0	11 0	15 9

(a) Municipal Market. (b) Approximately half of the protein is claimed to be animal protein.

Average Prices of Cabbages, Cauliflower and Tomatoes on Municipal Markets.

SEASON (1st July to 30th June).	CABBAGES (bag). (a) Johan-nesburg.	Cape Town.	Durban.	CAULIFLOWER (bag). (a) Johan-nesburg.	Cape Town.	Durban.	TOMATOES (Trays 15 lb.). Johannesburg. N.M. No. 1.	Other.	Cape Town.	Durban.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
1938–39	3 10	3 0	3 10	3 0	1 8	3 5	2 2	1 3	1 8	0 10
1940–41	5 10	4 8	7 1	3 11	4 3	5 3	2 7	1 6	2 1	1 2
1941—										
January	5 7	1 5	4 11	3 10	1 6	—	3 4	1 7	0 11	1 4
February	7 4	3 5	11 9	5 6	4 2	9 6	2 7	1 4	1 5	1 2
March	7 4	4 11	10 10	4 10	4 1	5 5	3 5	1 8	2 2	1 4
April	6 0	5 3	6 10	3 11	3 5	5 1	2 11	1 6	2 5	1 7
May	5 3	4 10	5 5	4 2	4 8	4 9	2 5	1 5	1 10	1 4
June	6 2	5 5	8 2	5 6	4 3	6 10	2 7	1 8	2 6	0 11
July	10 3	5 11	8 0	6 7	6 0	6 8	2 10	1 7	2 4	1 1
August	8 5	4 7	4 8	4 4	4 11	5 5	3 5	2 4	1 11	0 9
September	10 0	6 6	3 8	5 6	6 9	6 7	2 9	1 9	2 2	0 10
October	10 3	7 11	4 2	8 4	6 2	—	2 0	1 1	1 9	0 6
November	11 3	8 1	4 8	—	6 2	—	3 3	1 11	2 10	1 7
December	10 2	8 6	3 11	—	4 9	—	3 8	1 8	3 7	1 5
1942—										
January	7 7	5 4	9 1	8 1	4 0	—	2 11	1 0	1 6	2 1
February	8 0	6 3	18 3	5 10	—	—	3 6	1 7	1 5	1 5
March	7 3	6 0	22 9	5 6	8 0	—	5 8	2 7	1 3	2 6
April	8 2	4 9	16 3	6 4	5 8	12 6	5 4	2 6	1 8	1 11
May	7 7	3 9	10 0	6 2	5 0	11 5	3 11	2 4	2 10	1 7
June	6 11	3 2	7 10	6 10	5 2	7 11	2 8	1 5	2 5	1 4

(a) Weights of bags vary, but on the average are approximately as follows: For cabbages: Johannesburg, 105 lb., Cape Town 105 lb., and Durban 90 lb. For cauliflower: Johannesburg 100 lb., Cape Town 65 lb., and Durban 85 lb.

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FARMING IN SOUTH ... AFRICA

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Editorial:

Control of Blowflies in Sheep and Destructon of Carcases.

In consequence of numerous requests to the Government from agricultural associations and other bodies for the control of blowflies to be made compulsory, Government Notice No. 1957 was issued on 31 October, 1930, proclaiming the destruction of carcases to be compulsory.

It was known that blowflies can breed only in animal matter (not in manure or vegetable matter) and that hundreds or thousands of flies are found in practically every carcass, depending upon its size. Consequently, it was expected that the destruction of these breeding places would be an important measure for the control of blowflies. Furthermore, it was also known that merely to bury a carcass was not sufficient to destroy the maggots which continued to develop and finally emerged as blowflies. It was therefore prescribed in the abovementioned Notice that carcases should either be burnt or treated with poison prior to being buried. In addition, a distinction was drawn between (1) public roads and commonages on which a carcass had to be destroyed immediately in accordance with the provisions laid down, and (2) farms where, at the request of the farmers of a particular area, this regulation would come into force upon proclamation. Accordingly, in course of time the regulations came into force in most districts.

Recent investigations have revealed, however, that since keen competition takes place among the various species of blowflies in carcases, it is quite impossible for the actual sheep blowfly to breed in carcases during summer. The species of blowfly which ousts the abovementioned species from carcases is *not a sheep blowfly at all* and that it is quite harmless to animals.

It is the large blue blowfly which is the chief enemy of the sheep blowfly and which should be encouraged. The complete destruction of carcases in summer would result in the extermination of this particular fly, and is therefore an undesirable practice.

For the above reason reason it has been decided to repeal the abovementioned Government Notice (with the exception of the first part which refers to public roads and commonages), as well as all proclamations issued in respect of farms and made in consequence of this Notice. New recommendations relative to the treatment of carcases on farms will be published through the medium of "Farming in South Africa" and through other channels.

Since the application of different methods must be left to the discretion of the farmers concerned, depending upon the presence or absence of the large blowfly, these new recommendations cannot be satisfactorily prescribed by a general regulation enforcing their application. In the case of public roads and commonages, a carcass will usually be destroyed within 24 hours, a practice which is most

desirable. Consequently, such carcases are not very important in so far as the blowfly problem is concerned.

The following two points are of great importance:—

First, the carcases of animals which have died from anthrax, black quarter, gallamsiekte, etc., should not be left to lie about and spread these diseases. All carcases should, as far as possible, be destroyed at a suitable place. Secondly, carcases should be destroyed in such a manner that the sheep blowfly is controlled and its enemy encouraged. The correct method of treating a carcass is of the utmost importance in the control of blowflies and it is hoped that everyone concerned will carefully follow the new recomendations and abandon all old methods of treatment.

(Dr. H. O. Mönnig, Onderstepoort.)

Produce More Food.

To every citizen of the Union the food situation is a matter of extreme importance to-day. There must be sufficient food for every person in the Union—with some in reserve. Fortunately, there is at present no shortage, but our larders are not stocked nearly as well as they should be. In the troublous times in which we live, there should be sufficient food supplies to enable us to meet any emergency.

There are four factors which affect our food supplies:

(1) The drought of the past summer caused a great decrease in food production in the summer rainfall area;

(2) not only did we experience a decrease in production, but we also had to meet an appreciable increase in consumption as a result of military requirements and the demand for ships' stores;

(3) at the same time, opportunities for the importation of food were seriously reduced owing to the lack of shipping space, and

(4) lastly, as a result of the shortage of tin and carton containers, the preservation of perishable food products was seriously curtailed.

This last factor renders it a matter of great importance that no periodical surplusses of such products as vegetables should be allowed to occur. Actually, an increased production of vegetables is welcomed, but the increased supplies are required for consumption during the normal periods of scarcity, and not during the periods of peak production. A large surplus at any period can only result in waste and low prices, as the surplus cannot be canned or dried readily at present.

Products of which increased supplies are required are wheat, winter potatoes, oats, barley and rye, and both the seed and hay of all the leguminous crops. The latter in particular are in great demand as the normal importation of protein-rich products, such as groundnuts, copra, fish and meat meal have been seriously curtailed so that legumes must make good this deficiency. It is expected that the next maize crop will be larger than that of the previons season. As regards animal products, the request is mainly for increased production of all dairy products, followed in order of importance, by supplies of poultry products, bacon and all kinds of meat.

Unfortunately, increased production is being hampered at present by the shortage of all kinds of production requirements. Farmers must, for example, base their production programme for animal products on their available feed supplies, and should devote special attention to the production of all kinds of animal feeds in

 [Continued on page 578.

Weed Control and distance of Planting in Maize Production.

Dr. A. R. Saunders, Deputy-Director of Production,
Food Control Organization.

IN a region of such uncertain rainfall as our main maize-growing area it is essential that only those practices shall be employed which will reduce crop failures through drought to an absolute minimum. A policy of expecting the worst and preparing for it in due time, will, in the end, prove the most economical, for high yields in good seasons and crop failures in relatively poor ones constitute one of the greatest weaknesses in our whole agricultural system. Fair average returns are not enough if there is an unduly wide fluctuation between the highest and the lowest yields, and the main object should be consistency and stability of production in so far as the vagaries of nature will allow.

The most effective methods of minimizing the effects of drought are efficient weed control and relatively wide spacing of the crop. In proportion to the total amount of vegetable matter they produce, weeds generally take up more water from the soil than maize. During periods of drought, conditions are therefore much more difficult on weedy than on clean lands. The argument that the moisture required by weeds would be lost in any case through evaporation from the soil surface, if the weeds were not there, is only partly true, for the moisture transpired from a given area of leaf surface is invariably much greater than that lost by evaporation from a corresponding surface of soil.

Germination of Weeds.

Depending somewhat upon the type of soil, most weed seeds will germinate only in the upper layer of 3 to 4 inches in depth. Upon this fact is based one of the most economical practices of weed control, viz., that of pre-cleaning. This consists in destroying one or more crops of weed seedlings by means of a disc harrow or other suitable implement *without turning over the soil and thus bringing a fresh crop of weed seeds to the surface.* The practice naturally presupposes that the soil has been well ploughed beforehand and that it is in a workable condition. Destruction of weed seedlings should take place when they are small and before they are well established. An interval of a week to 10 days between cultivations is usually sufficient if the soil is moist. The operation may be continued until after planting, but in that case the ordinary spike-tooth harrow should replace the disc when once the maize or other crop is in the ground.

Cultivation after planting needs no discussion, beyond stating that a common fault in this regard is to delay operations until the weeds are too big. If weeds are well routed and wet weather follows immediately after cultivation, a large percentage of weeds will re-establish themselves immediately, with the result that by the time the soil is dry enough to be worked again the growth is too far developed for the ordinary cultivator to do efficient work.

Soil Mulch.

A matter about which there is a good deal of controversy and conflicting evidence is that of the soil mulch. The type of soil and the character of the rainfall are factors to be considered, but in the main

it can be said, without reservation, that the value of the mulch as a means of preserving soil moisture has in the past been greatly overrated. In the case of soils which are inclined to form a crust after a heavy rain, cultivation to break the crust may facilitate moisture penetration when the next rain falls, but the chief aim of inter-row cultivation should in all cases be the control of weeds.

A thick stand of maize will make as great demands on soil moisture as a thinner stand with considerable weed growth. Hence fatal combination under droughty conditions is that of too close planting and heavy weed infestation. Numerous instances occur during droughty seasons where one farmer's crop fails entirely through too close spacing or severe weed competition or both, while his neighbour's lands, often only a few hundred yards away, produce 20 bags or more per morgen. The remarkable fact is not how little but how much drought an average maize crop can endure if the stand is not too close and weeds are controlled efficiently.

Distance of Planting.

The optimum stand will vary according to average rainfall, the fertility of the soil and the variety used. No hard and fast rules can therefore be laid down, but experiments over a long period of years have shown that where the rainfall is insufficient to render possible a yield of more than 20 bags per morgen from any spacing, the average spacing of plants should not be closer together than 3 feet each way. In high rainfall areas the espacement may be much closer, though it is doubtful whether even in the best parts of our maize area the distance between plants in the row should be less than 18 inches.

Blank ears and barren plants are pre-eminently due to too close spacing, and there is a definite inverse relationship between weight of grain per ear and distance of planting. Thus at a spacing of 36 inches in the row the mean weight of grain per ear is more than twice that obtained at a spacing of 12 inches. The quality of grain is also affected. The wider the planting distance, the better the quality and the lower the cost of harvesting per unit area of land.

On the question of continuous rows *versus* check-row planting the experimental evidence is consistent and indicates that with the same number of plants per morgen, planting in continuous rows will give slightly better results than planting in check-rowed hills, *provided no weed growth is present.* However, since better weed control can be brought about at a lower cost through check-row planting, the results, in practice, are more than likely to favour this method. Consequently its employment, by those farmers who have the necessary appliances, is strongly recommended.

Maize for Silage.

In the foregoing discussion the main consideration has been grain production. For purposes of silage or fodder the spacing can, with advantage, be appreciably closer, though here, too, a limit is soon reached beyond which the risk of crop failure is greatly increased. A safe guide is that the amount of seed planted per morgen may be 50 per cent. greater than for grain production.

Admittedly, wide spacing may result in slightly lower yields during favourable seasons than might be obtained from close spacing, but these losses are far outweighed by gains during dry years. The intention is not to encourage pessimism, but to guard against unhealthy complacency.

Ticks and Tick-borne Diseases.

Part I.—The Argasidae and Ixodidae.

R. Du Toit, Veterinary Research Officer, Onderstepoort.

IN many parts of South Africa ticks play so important a rôle, both by virtue of the direct effects of their attacks on animals and their indirect effects due to the diseases transmitted by them, that they may be said to constitute a limiting factor to successful farming unless vigorous efforts are made to control them.

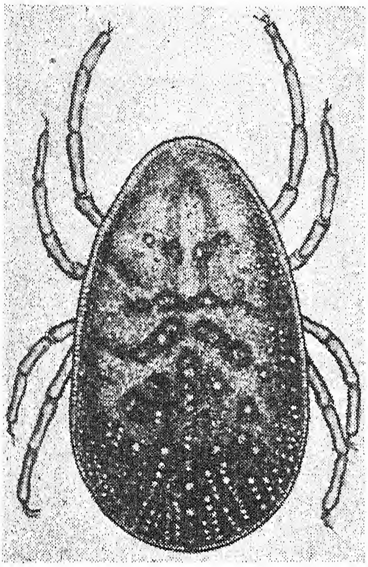

FIG. 1.—The Fowl Tick (Adult). Magnified 8 times.

The direct effects produced by tick infestation are often more serious than is realized. When numerous, the amount of blood removed from their hosts may be so considerable as even to bring about death from exsanguination, Sir Arnold Theiler records the case of a horse which died from acute anaemia and from which 14 lb. of blue ticks were collected within 3 days. This constituted only about half the ticks which actually gorged on the animal which, therefore, lost over 2 gallons of blood from tick infestation. Tick bites in themselves are painful and very prone to invasion by secondary organisms which set up abscesses, large and deep-seated suppurating wounds and give rise to the host of injuries, such as sloughed teats, missing tips of tails, foot rot, severe and painful lameness, maggot infestation, etc.

The indirect effects are even more serious and the numerous diseases directly transmitted by ticks are responsible for enormous annual losses of live-stock throughout the country, entailing the expenditure of many thousands of pounds yearly in remedies, labour and construction work for the control of these parasites. The problems are of so complicated a nature that very intensive research work has been, and is necessary in elucidating the many and varied sides to the problem. It is with the object of bringing before the public some aspects of this problem that this article now appears, in order that, with a clear understanding of the many difficulties and the control measures advocated can be intelligently applied.

Necessity for Accurate Identification of Tick Species.

There are scarcely any tick species which may be said to be identical as regards their distribution, life histories and habits and their capacities and modes of transmission of disease. It is absolutely

essential, therefore, that we should be in a position to recognise at least the species of greatest economic importance and be in possession of the knowledge concerning their habits in order to be able to apply control measures with a reasonable chance of success. Furthermore, this knowledge is necessary in order that the farmer may be able to protect his business from the disastrous consequences of the introduction of a new species of tick on to his farm, or a disease-transmitting species infected with a disease the introduction of which might ruin him.

Classification and Description of the Main Groups of Ticks.

The ticks, though often referred to as insects, are actually widely separated from them and fall within the group *Acarina* which also includes the mites. They may be readily distinguished from insects by the presence of 4 pairs of legs, no clearly defined head, thorax and abdomen, the absence of antennae or anterior feelers and the fact that the body does not show the characteristic segments of insects. They are more closely related to the spiders and scorpions.

The group or super family, which is known as the *Ixodoidea*, is divided into two families, the *Ixodidae* and *Argasidae* and within these two groups are contained the 60 species which parasitise mammals, birds and reptiles in South Africa.

The *Argasidae*, which includes the tampans, contains only 3 or 4 species which are of interest to us from the economic point of view, and its members may be readily distinguished from those of the *Ixodidae* both in appearance, habits and life histories. Argasid ticks are characterized by the fact that the outer covering, which is tough and leathery, contains no plates or shields and is more or less uniform in appearance all over the body. The mouth parts in the nymphs and adults are situated towards the front of the lower surface and are generally not visible from above. The males and females can only be distinguished from each other by the shape of the sexual orifice, which is situated on the under surface of the body between the first or second pair of legs. Eyes, when present, are four in number, situated on the supra-coxal fold. The life histories though similar to those of the *Ixodidae* in so far that there are four stages, namely, egg, larva, nymph and adult, vary in that there are at least two nymphal stages and in some cases as many as 6 or 7. The habits of the *Argasidae* vary considerably but by far the greater number of the species do not remain attached to their hosts for any length of time, as do the *Ixodidae*, but feed for short intervals at a time and retire to their secluded places of concealment. Eggs are laid in small batches, usually after each feed.

The *Ixodidae*, which is a large group containing about 260 species of which 50 are known to occur in South Africa, includes those species of greatest economic importance to us. The species are characterized by the presence of a hard shield, which covers the entire upper surface of the body in the male and a small area at the front in the females, nymphs and larvae. The mouth parts are situated on the basis capitulum or false head and are always visible when viewed from above. Eyes, when present, are two in number and situated on either side of the shield or scutum. The various developmental stages consist of egg, larva, nymph and adult, but the life histories vary from those of the *Argasidae* in that feeding for the particular stage is completed at one operation, which is of considerably greater duration than in the case of *Argasidae*. Eggs are laid in a single large batch.

With this brief description of the groups and their general habits the more important species may now be discussed. It is intended to enumerate only those features which will serve to differentiate the species in order that control measures based upon these facts may be intelligently applied.

The Family Argasidae.

There are only three members of this family which are of significance to us in South Africa. These are the fowl tick, the spinose ear tick and, the tampan tick.

The Fowl Tick.

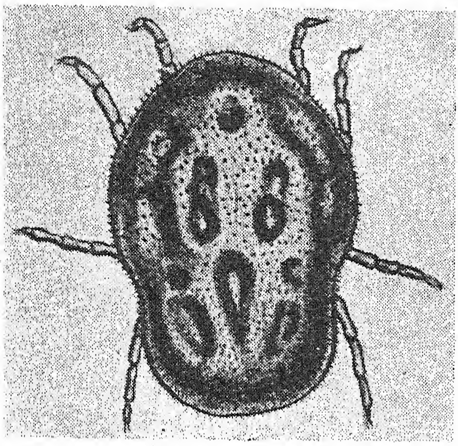

FIG. 2a.—The Spinose Ear Tick (Engorged nymph). Magnified 6 times.

The fowl tick *Argas persicus*, Oken, Fig. 1, is often wrongly spoken of as the tampan, a term which should only be applied to the human tampan to be described later. It is essentially a parasite of fowls, but occurs also on a variety of other birds and occasionally attacks man. It has a very wide distribution throughout the world and has been taken in all parts of the Union.

It is easily recognised by the elongate oval outline of the body, which is slightly more pointed in front and much flattened from above to below. It occurs principally in cracks and crevices in the walls and woodwork of fowl runs or under the bark of trees.

Life history.—The females lay batches of eggs of from 20 to 100 in their places of concealment. These eggs hatch in about three weeks, and the minute pale-coloured six-legged larvae crawl about actively in search of a host. The larvae remain attached to their hosts where they engorge themselves in from 5 to 10 days and drop off to moult into nymphs. The nymphs, which have 8 legs, resemble the adults, but are somewhat smaller and may be distinguished from the adults by the absence of a sexual orifice. Two nymphal stages occur with a moult between each and the adults then appear after the final moult. Lounsbury showed the complete life cycle, from egg to egg, to occupy about 10 months in this country.

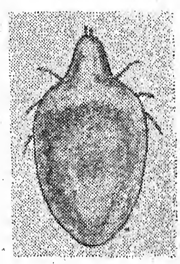

FIG. 2b.—The Spinose Ear Tick (Engorged Larva). Magnified 8 times.

Habits.—Although the larval stage remains on the host until engorgement has been completed—a fact which is made use of in combating this species, as will be described under the appropriate section—the nymphs and adults are periodical feeders. Feeding is carried out mainly at night when the birds are sleeping on their perches or in the branches of trees, and is completed in from 1 to 1½ hours. The parasite then returns to its hiding place when a moult or the laying of a batch of eggs takes place according to the stage.

Transmission of Disease.—The fowl tick is the chief transmitter of the fowl spirochaete (*Spirochaeta anserina*) responsible for spirochateosis, a rapidly fatal disease of poultry. Infection is acquired by the tick from an infected bird, and such infected ticks may transmit the disease to susceptible birds for 6 months or longer, or the infection may pass through the egg to be transmitted in the following generation. It has been shown that infection may even pass to a succeeding generation of ticks without reinfection of the ticks.

Bedford and Coles have shown the fowl tick to be an effective transmitter of the protozoon parasite, *Aegyptianella pullorum*, which is frequently fatal to poultry and other domestic birds.

The Spinose Ear Tick.

The Spinose Ear Tick (*Argas megnini*, Duges) (Fig. 2A) is a native of America, but has been introduced into many parts of the world and is to-day widely distributed in South Africa. It occurs only in the ears of its hosts in the larval and nymphal stages, the adults being non-parasitic, and is typically a species favouring a dry climate.

The larval and nymphal stages, which occur in the ears of cattle, horses, sheep, dogs and even occasionally in man, are easily recognised by their characteristic appearance. The engorged larva (Fig. 2B), is a small white or reddish pear-shaped object, usually appearing as a small translucent bladder, which is incapable of movement and hence frequently mistaken for an egg. The 6 legs are pale and inconspicuous and only distinctly seen with the aid of a pocket lens. To start with, the 8-legged nymph is pale, with the legs appearing exceptionally large in comparison with the body. The tick soon assumes a blue grey colour and the body assumes the shape of a violin with a constriction in the middle. The parasite is much less flattened than the fowl tick and the edges are rounded. Small upright spines, particularly pronounced in front, cover the body and these serve to differentiate the species from the human tampan. The adults, which are not found in the ears, resemble the nymphs, but may be distinguished from them by the minute pits which take the place of the spines of the nymphs, and the presence of a sexual orifice on the underside, and the fact that the mouth parts are only partially developed.

Life History.—The larva, which is a minute six-legged object with elongated mouth parts, crawls about actively in search of a host and makes directly for the ears, where it attaches itself deep down in the external ear. Here it engorges itself in from 5 to 10 days and then becomes quiescent until the outer skin is cast and the nymph emerges. The nymph immediately commences feeding, which may be completed in as short a period as a week, but is generally much longer. The nymphs have been observed in the ears for as long as 3 months and certain American observers state that this period may be as long as 7 months. After engorgement the nymphs leave the ears and secrete themselves in cracks or crevices in kraal or stable walls or in posts close to the ground or under the bark of trees. The nymphs moult to adults within a period of from 4 to 11 days and fertilization takes place shortly afterwards. Eggs are deposited within a period of about 14 days and these hatch in from 7 to 56 days depending upon temperature. Although the adults are not parasitic and are unable to feed, owing to only partial development of the mouth parts, the eggs are nevertheless laid in small batches in common with the practice of other members of the family. The com-

plete life cycle from egg to egg may be as short as 7 to 8 weeks or may occupy a period of a year or even longer.

Due, presumably, to the fact that mating of the sexes occurs away from the host, which makes it necessary for the sexes to find each other, a matter which is possible only in more or less confined spaces, infestations with ear ticks are typically kraal or stable infections and are seldom contracted in the open veld. Such localities may remain infected for several years, as this tick possesses phenomenal powers of resistance to hunger and adverse climatic conditions.

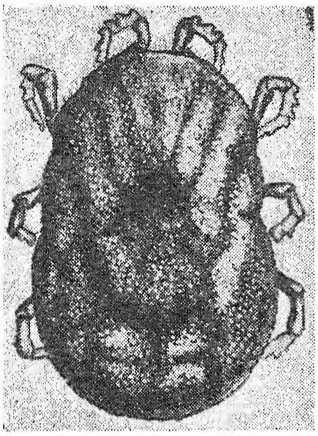

Fig. 3.—The Tampan Tick (Engorged Adult). Magnified 6 times.

Although the spinose ear tick is not responsible for the transmission of any disease, it may be responsible for considerable economic loss and may even bring about the death of animals. Infected animals are restless and feeding is interfered with due to the constant irritation caused by the bites of the ticks and substances injected by them, and they lose condition rapidly. Occasionally perforation of the ear drum has been observed and secondary invading bacteria have penetrated the inner ear and caused death due to meningitis.

The Tampan Tick.

This tick (*Argas moubata*, Murray) Fig. 3 is typically a parasite of human beings, but has been known to attack a variety of domestic animals and has even been taken off tortoises in the Kimberley area. In appearance it resembles the spinose ear tick, but may be distinguished from it by the body covering being mamillated or covered with small raised areas.

It is fairly widely distributed in the drier parts of South Africa such as the north-west Cape, Bechuanaland and the western and northern Transvaal. It is most frequently met with around trees in the dry sandy areas and is common in the Vryburg, Kuruman, Hay and Gordonia districts, but it appears to be spreading and constitutes a common infestation in native huts in many parts today.

Life History.—Feeding is carried out rapidly, and by preference at night, but animals are frequently attacked while resting under the shade of trees. After feeding the eggs are deposited by the females, in the ground near the bases of trees, under the bark, or in cracks in walls in native huts. Batches of eggs vary in number frmo 20 to over 300, and a single female has been known to lay as many as 1,217 eggs in all. Hatching occurs after 8 to 25 days and the larvae either remain within the egg shell or free themselves and remain motionless until moulting occurs 3 to 13 days later. There may be several nymphal stages, those nymphs destined to become females showing a greater number of moults than the males. In this way there may be as few as 2 or as many as 7 nymphal stages.

Transmission of Disease.—The Tampan tick is the transmitter of relapsing or tick fever, caused by *Spirochaeta duttoni*, to man in various parts of Africa and there is a record of a severe outbreak

of this disease in natives in the Union. It has also been shown, experimentally, to be capable of transmitting spirochaetosis, caused by *Spirochaeta anserina*, to fowls.

A closely allied species, the eyed tampan (*Argas savigni, Audouin*), which may be distinquished from the preceding species by the presence of four eyes on the supra coxal fold, is also widely distributed in Africa, but is much less common in the Union than the eyeless tampan. It has been found attacking various species of domestic animals and man in the Steytlerville district and occasionally in the north-western Cape districts.

The Family Ixodidae.

This family includes a large number of species amongst which are included those responsible for the transmission of the most important protozoon diseases in our domesticated animals. The habit of the species of the group to remain attached to their hosts for considerable periods while feeding, make these ticks easily observed and hence, when ticks are spoken of, it is generally on the members of this family that the mind is centred.

The family *Ixodidae* is divided into a number of genera on the basis of external characters, and from the point of view of recognition of the species it is as well to adhere to this grouping. It is possible, however, to distinguish three main groups based on differences in life history and in this respect may be distinguished:—

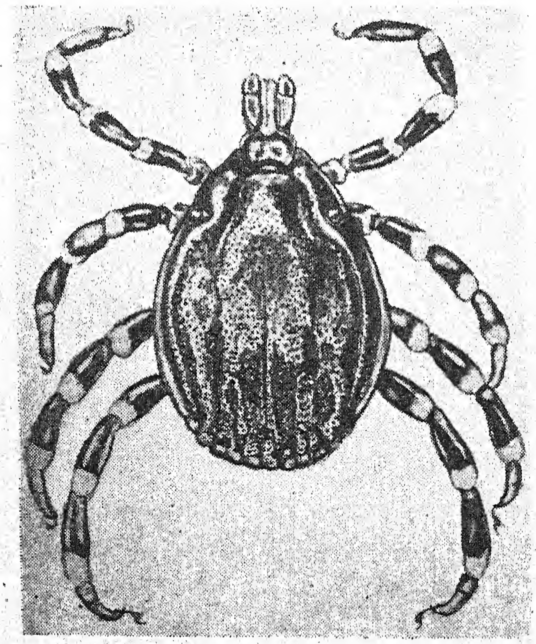

FIG. 4.—The Sheep Paralysis Tick (Partially Engorged Female). Magnified 10 times.

(*a*) *One-host ticks*, wherein the larval, nymphal and adult stages all occur on one and the same host, the moults between the stages occurring while the tick remains attached to its host. The group includes the Blue Tick and the Argentine Tick.

(*b*) *Two-host ticks*, in which the larval and nymphal stages occur on one host and the adult on another. In this case moulting from the larval to nymphal stage generally occurs in the ears of the host, the engorged nymph then dropping from the host to moult on the ground. The adults then seek another host. The red tick and bont-legged tick are included in this group although the latter species might also act as a three-host tick.

(*c*) *Three-host ticks*, in this case each stage completes its engorgement on a host from which it drops and moults on the ground again to

attach itself in the following stage upon a new host. The bont tick, paralysis tick and the brown ticks are included in this group.

As space is limited and the intention of this article is to serve as a guide to the recognition of some of the more important of our tick species, the various genera will not be discusse dseparately, but the more important species discussed in accordance with their capacities in bringing about economic loss amongst our livestock.

Harmful Ticks Not Associated with the Speard of Disease.

The Sheep Paralysis Tick.

This species (*Ixodes pilosus*, Koch) Fig. 4, is common in the grass veld areas near the coast of the eastern Cape Province, where it is often referred to as the *Russet* or *Bush Tick*, but has been recorded from all four provinces of the Union.

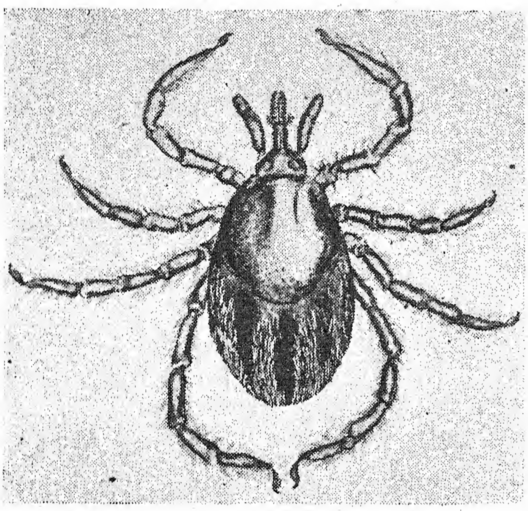

FIG. 5.—The Bont-Legged Tick (Male). Magnified 8 times.

It is a small species, the body measuring not more than about ⅛ in. in length in the unengorged state. The colour is reddish brown in both sexes, but when engorged, the female assumes a slate-blue colour, the body takes the shape of a sphere slightly more pointed in front, and the legs appear to be crowded together close to the mouth parts. the species is easily recognised by the long and flexible mouth parts, narrower and longer in the female than in the male. The legs are relatively long and slender and eyes are absent. The male shows the presence of a distinct ridge encircling the margin of the body behind. On the under surface, in both sexes, a horseshoe-shaped groove encircles the anus in front.

Life-history.—This species may be said to be predominantly a winter tick and is most active from about April to September. Three hosts are required for its cycle, the larval and nymphal stages occurring on small veld animals, e.g. hares, field mice and rats, etc., and the adults only being found on domestic stock, where they are most frequently met with on the legs and under surfaces of the neck and body. The females engorge themselves in from 5 to 7 days.

Relation to Disease.—As its name implies this tick is capable of producing paralysis in animals, particularly merinos and goats. The cause of this paralysis is not clearly understood but it would appear to be due to some toxin secreted by certain females only, as it is frequently observed that an animal remains unaffected when literilly covered with these ticks, whereas others show severe

paralysis when only a single tick can be found. It has been noted in Australia that those females associated with paralysis show a marked enlargement of the salivary glands.

When the ticks are removed the paralysis generally disappears rapidly if the condition is not already too far advanced.

The Karroo Paralysis Tick.

This species (*Ixodes rubicundus*, Neumann), is closely related to the preceding and is difficult to distinguish from it. It may be distinguished, however, by the fact that it is generally somewhat darker in colour and by the anal groove, the arms of which are parallel instead of, as in the case of *I. pilosus*, converging towards each other behind.

It is common in the eastern central Cape Province where it occurs on the stony karroo hills. It has been noted that the sites favoured by it are the eastern slopes of the hills which catch the morning sun and it is probably in these situations that the hosts of the immature stages, viz., the Cape red hare and the elephant shrew, are most abundant. The species has, however, been recorded from the Transvaal and Northern Rhodesia, and cases of paralysis due to it have been noted in cattle and vaal rhebok in addition to sheep and goats.

The Bont Legged Tick.

Two varieties of this species are recognised in South Africa, namely *Hyalomma aegyptium var. impressum* (Koch), Fig. 5, and var. *aegyptium* (Linnaeus). These two varieties are distinguished on differences in the pitting or punctuation of the shields, but, as for practical purposes, the two varieties differ little in distribution and habits, these differences are of little importance. The species is characterised by the fact that the legs are banded with white or yellowish bands, the shield in both male and female is uniformly black, hemispherical eyes are present and the mouth parts are particularly long. The species is widely distributed in the Union but occurs principally in the drier parts of the country such as the western and northern Cape areas, Orange Free State and Western Transvaal.

Life History.—This tick falls into the group of the two-host ticks, although on occasion three hosts may be necessary, as the larvae might drop from the first host after engorgement instead of moulting on the host to the nymph, which is the normal procedure. The adults are found on the more hairless portions of the body, e.g. under the tails of cattle, on udders or around the claws of sheep or on the tails of the haired or bastard classes. The female completes her engorgement in about 7 days and drops off to lay from 10,000 to 15,000 eggs under stones or other sheltered places. The eggs take roughly a month to hatch and the six-legged larvae are found mainly on small veld animals such as field rats and mice, hares, etc. Great powers of resistance to adverse conditions are displayed by the adults, which have been kept alive without food for two years, the nymphs for three months and the larvae for a year.

Relation to Disease.—Although this species, or a species very closely allied to it, have been incriminated in the spread of infectious diseases in other parts of Africa, so far as is known no disease producing organism has been transmitted by it to domestic animals in the Union as yet. It has, however, been incriminated in the

 [Continued on page 587.

Compost.

Dr. I. S. Perold, Professional Officer (Agricultural Chemistry), Stellenbosch-Elsenburg College of Agriculture.

IT is a well-known fact that continual cultivation of the soil eventually leads to a complete depletion of plant nutrients. In the past this depletion was counteracted by bringing virgin soils under cultivation or by applying the excreta of animals. The modern farmer uses chemical fertilizers, but experience has proved that the application of these inorganic fertilizers must go hand in hand with applications of organic material in some or other form. It is impossible and impracticable to return to the soil all the organic matter which it loses, but by regular applications of organic matter total deterioration can be prevented.

Composition of the Plant.

Since organic matter is largely derived from plant tissues, it is important to know how a plant is constituted, and what happens in the process of decay.

The main groups of components of a plant are: (*a*) Water-soluble substances such as carbohydrates, starches, etc.; (*b*) cellulose and hemi-cellulose; (*c*) lignin; (*d*) proteins; (*e*) fats, plant oils and waxes, and (*f*) mineral matter. From the point of view of soil fertility, all these groups are important, but we shall deal only with the carbohydrates, proteins and lignin.

The carbon:nitrogen ratio.—When analysing fresh plant material, it is invariably found that it contains much more carbon than nitrogen. The former is derived from the carbohydrates, whereas the latter is derived from the proteins. The ratio of carbon to nitrogen is most important as regards soil fertility. If plant matter, such as wheat straw, with a wide carbon:nitrogen ratio, is incorporated into a soil, the productivity of the soil in the initial stages is lowered. Only after a period of six months or even longer, i.e., after most of the straw is decomposed, will such a soil be able to produce a normal crop. It is thus evident that a negative period sets in during the process of decay, and this negative period is dependent upon the activities of certain micro-organisms in the soil. Since these micro-organisms need carbon as well as nitrogen for their normal existence, they start attacking the carbohydrates and proteins of the organic matter immediately after it has been incorporated. In the case of carbohydrates, carbon becomes available and carbon dioxide and water are set free. The carbon dioxide dissolves in the soil moisture to form very dilute carbonic acid which renders reserve mineral matter in the soil more available.

Apart from carbon these micro-organisms also require nitrogen. If the supply of carbohydrate in the soil greatly exceeds that of the protein, the latter is broken down in sufficient quantities to satisfy their nitrogen requirements only. When all the available carbohydrates have been used up they attack the proteins, and only at this stage will nitrogen make its appearance in the soil. The micro-organisms responsible for the splitting up of the carbohydrates and

proteins prefer a neutral medium, and are predominantly aerobic in nature, i.e., they require oxygen for normal development. The negative period in most soil types, especially in regions with a high rainfall, will therefore be fairly long.

In the preparation of compost, conditions are created whereby the carbon : nitrogen ratio is narrowed in a relatively short period, with the result that there is practically no negative period when the manure is incorporated into the soil.

The Humification of Lignin.—Lignin is the parent material of the real humus. Unlike the carbohydrates and proteins, lignin is not decomposed through microbial action, but can be converted into humus only through oxidation. Consequently an excess of oxygen is required for this process, and since most soils lack an excess of air, humification will be relatively slow.

Every observant farmer knows with what difficulty oak leaves decompose in soils, but he also knows that such leaves, when completely decomposed, have a beneficial effect on the physical condition of the soil. The reason for this slow decomposition is the inadequate supply of air in the soil. In the preparation of compost provision is made for sufficient air with a view to accelerating humification.

Artificial Decomposition of Plant Material.

After the Great War of 1914-1918 fertilizers were very expensive, with the result that scientists directed their attention to the preparation of artificial manure. Richards and Hutchinson in England were pioneers in this respect with their well-known "Adco". Their method was based on the principle of accelerating the decomposition of organic material in heaps by the addition of certain chemicals. However, this is rather expensive, and under present conditions it cannot be recommended in this country.

In 1931 Howard and his associates at Indore, India, introduced a new and valuable method whereby plant material is transformed outside the soil into available organic manure. In a treatise "The Waste Products of Agriculture" by Howard and Wad, the method is described in detail. It is dependent on three important factors which are required by the microbes responsible for the decomposition of the plant material, viz., (*a*) air, (*b*) moisture and (*c*) a neutral or sweet medium. The method differs from the "Adco" process in so far as no chemicals or chemical fertilizers are added to the plant material; but only small quantities of manure and soil.

In South Africa, conditions are such that the method followed in India cannot be adopted in full. The method in use is based on the principles introduced by Howard and Wad, but the technique is different.

Materials From Which Compost is Made.

(1) All waste products on the farm, such as old bedding from stables and kraals, grass, leaves, twigs and prunings, chaff, straw, bushes, shrubs and weeds are used. Where the plant material is still green it should not be used immediately, but first allowed to wilt. Most of these materials can be packed in regular layers, but difficulty is encountered with prunings from vines and fruit trees. Owing to the shape of these materials turning is very cumbersome, and decomposition in the heap proceeds very slowly. These difficulties can be

overcome in two ways: Firstly a very cheap type of mill can be used for cutting the material into 6-inch lengths before taking it to the compost heap, or the material can be kept over for a year before composting it. The easiest method is to stack the fresh prunings in a heap for a year. In this heap the material is attacked by insects which make it brittle, and this makes handling easier.

(2) Apart from the above-mentioned materials, limited quantities of manure are required for making compost. Manure is always contaminated with microbes, and thus serves as a source of inoculation for the various layers of plant material. On many farms the tractor has superseded draught animals to a large extent, and there will be a shortage of manure. This can be supplemented by increasing the bedding in the stable of the few animals still on the farm. At Elsenburg excellent results have been obtained with a mixture of manure- and urine-impregnated straw in a ratio of approximately two parts by weight of manure to three parts by weight of straw. The manure used can be that of any animal or bird. Where the supply of stable manure is inadequate Karoo manure can be used, but it is imperative that the manure is not too old. A pitch black and odourless manure should never be used. Experiments have proved that the best results are obtained with Karoo manure previously mixed with stable manure.

(3) In addition to the plant residues and manure a limited amount of loamy surface soil is required. The functions of the soil are firstly to supply micro-organisms, and secondly to absorb beneficial gases. Since the microbes responsible for decomposition require a neutral medium, it is essential to use a sweet or neutral soil. If such a soil is not obtainable some wood-ash or agricultural lime must be used with it.

Establishing the Compost Heap.

A compost heap can be established on the surface or in a shallow pit about 1 foot deep. The pit system is more expensive and is recommended only in cases where prevailing winds cause excessive drying out of the heaps. The heap should be 15 to 18 feet wide and can be of any convenient length; preferably not exceeding 45 feet. In order to prevent too great a pressure on the lower layers, it is advisable that the height be not more than 3 to 4 feet.

The procedure in establishing the heap is as follows: Put down plant residues to a height of 12 to 15 inches and cover it with a layer of surface soil—about ½ inch—and if the soil is acid, spread some lime or wood-ash over it. The second and third layers are put on in exactly the same way, and the last layer is well covered with about 1 inch of soil. The different layers are watered separately, but not to such an extent that the heap is drenched. After 6 to 12 hours a rise in temperature in the heap will set in and after 24 hours it ought to be about 130° F. or 55° C.

The rise in temperature is caused by the rapid decomposition of the organic material by micro-organisms, and will be maintained as long as sufficient air and moisture are present. For this reason it should be seen to that no trampling down of the heap takes place, and that it does not dry out. An easy way of ascertaining whether the heap is warm enough and whether it has sufficient moisture, is to push an iron standard into it. The standard when withdrawn should be hot to the touch, and should have a film of moisture on its surface. If this is not the case, water must be added to the heap. At

Elsenburg the experience has been that it is hardly ever necessary to water the heaps during the winter months, and for this reason it is advisable to make compost in winter in the western Cape Province. There is also the added advantage that the compost is ready at the end of winter, i.e., at a time when it is most needed by the plants.

Turning the Heap.—The compost heap should be turned for the first time after about a month, and thereafter every three weeks. After three or four months it should be ready. In cases where an excess of woody material is used, the rate of decomposition will be slow. To accelerate the decomposition, it is advisable not to use woody materials, exclusively, but to mix them with straw, shrubs, bushes or grass. Even in cases where only straw or chaff is used, the decomposition is very uneven in the initial stages, and it is always advantageous to make a mixture of different types of materials. In turning the heap care should be taken that the material on the outside is brought to the centre of the new heap. It is very seldom necessary to add additional manure and soil, or to cover the heap with a layer of soil when it is being turned. The main object in turning the heap is to mix the decomposing mass thoroughly, and thereby introduce sufficient air. Occasionally it happens that no rise in temperature sets in, and in such cases a small amount of manure can be added when turning the heap.

Kraal Compost.

On many farms it is the custom to cart shrubs and straw into the kraal, where it mixes with the manure and becomes impregnated with urine. This is a very sound system, but it has certain defects. Firstly, the mass is trampled down too firmly, resulting in a very slow humification of the lignin. The manure from such kraals will always contain undecomposed materials. Secondly, there may be a big loss of nitrogen from such kraals.

The defects of this system can, however, be remedied by making compost in the kraal, and experience has proved this to be the easiest and cheapest way of making compost. The shrubs and other waste materials are brought into the kraal to a height of 2-3 feet, and the animals then kept in the kraal until the mass is trampled down to a height of 18 inches. Now remove the animals and turn the materials in the kraal. In the case of a small kraal the materials can be turned over in one heap, but with bigger kraals it is advisable to turn it in sections so as to incorporate more air into the decaying mass. The number of turnings will depend upon how urgently the manure is required. In cases where manure is applied once a year only, the mass need only be turned 2 or 3 times. If, however, the manure is required more frequently, the kraal must be turned more often, and at shorter intervals, e.g., after every 4 to 6 weeks. *The success of the system depends upon the turning, and the important point is that the kraal must not be turned once a year as is customary on most farms, but at frequent intervals.*

Some farmers prefer to remove the decaying mass from the kraal after the first or second turning. They stack it in heaps outside the kraal and turn it at frequent intervals until the material is sufficiently fine and mature. As soon as the desired stage of maturity is reached, the manure can be carted on to the lands and worked in, but if not required immediately, it must be trampled down firmly and left until required. Instead of removing the materials from the kraal,

some farmers prefer temporary, removable kraals, built of cheap materials.

The kraal system has the advantage that manure from stables can be worked through the kraal instead of being stacked in the open where it is exposed to the elements. The manure from stables will accelerate the rate of decomposition, since fresh stable manure is always impregnated with urine.

The Chemical Composition of Compost.

The composition of the final product will depend on the nature of the materials used. The following figures were obtained at Elsenburg from compost made from wheat straw, bluegum twigs and leaves, old thatch, grass, and weeds:—

Sample No.	Moisture Content.	Composition on the Dry Basis.		
		Total Nitrogen.	Total Potassium Oxide.	Total Phosphorus Pentoxide.
	%	%	%	%
1	43·7	0·73	0·99	0·44
2	42·9	0·69	1·04	0·45
3	46·2	0·63	0·88	0·29
4	42·9	0·83	1·05	0·39
5	42·7	0·69	0·92	0·36

The average composition is therefore as follows: 0·71 per cent. nitrogen, 0·976 per cent. potassium oxide and 0·386 per cent. phosphorus pentoxide. Suppose now that 20 tons of compost (=$11\frac{1}{4}$ tons of dry material) be applied per morgen, then the actual weight of major plant nutrients is: 160 lb. nitrogen, 220 lb. potassium oxide and 87 lb. phosphorus pentoxide. These plant nutrients are not essentially in the same form as in the well-known fertilizers, sulphate of ammonia, muriate of potash and superphosphate, but it is important to note that 800 lb. sulphate of ammonia, 367 lb. muriate of potash and 543 lb. superphosphate (16 per cent.) must be applied to get the weight of major plant nutrients contained in 20 tons of this compost. Since the availability of the plant nutrients in compost is very high, and the nitrogen is present as organic nitrogen, the value of compost cannot be over-estimated. A comparative test carried out in the Cape Flats recently proved that different kinds of vegetables responded much better to compost than to ordinary manure, especially in the initial stages of growth.

The Cost of Making Compost.

It is very difficult to estimate the cost of making compost since too many factors must be taken into account, but a detailed analysis has brought the cost to 4s. 6d. per ton.

The Application of Compost.

The amount of compost to be applied will depend largely on the materials from which it is made. If these materials are of inferior quality, the nutrient content will be low, and more compost will be required per morgen.

The rate of application is also dependent upon the type of soil. Loams and sandy loams usually require less than sandy soils and heavy clays.

The third and perhaps most important factor is the type of crop for which the compost is intended. For vegetables 600 to 900 bushel baskets must be applied per morgen, but for vines and fruit trees 450 to 600 bushel baskets per morgen ought to be sufficient. Since the moisture content of compost varies considerably, the quantities to be applied are given as bushel baskets per morgen and not as tons per morgen. Many farmers do not know how much a ton of manure is, and it may, therefore, interest them to know that 1 cubic yard of compost with 40 per cent. moisture weighs from 1,300 to 1,500 lb.

Stable manure usually contains a fair amount of straw, and can therefore be applied with stable forks. Compost on the other hand is so fine that it passes between the teeth of a fork, and the farmer may find it necessary to use spades for broadcasting it. The degree of fineness is important in that it indicates when the compost is ready, and secondly the finer material is much cheaper to handle than manure.

When compost is applied, it must not be left for long periods in small heaps on the land, since this results in a decrease in value. This also applies to stable manure. It should be broadcast and ploughed under as soon as possible. If it so happens that the compost is ready, but that the farmer cannot apply it immediately, he should rather leave it in the original heap. To prevent loss, this heap should be well trampled down and covered with a layer of soil.

Conclusion.

The aim of compost-making is most decidedly not to get rid of manure, but to supplement it. Compost-making is of the greatest importance to the farmer who is forced to buy manure, since it enables him to use the little manure he has to the best advantage and it also enables him to change unavailable plant nutrients in the form of plant residues into available plant nutrients in a comparatively short time.

Chemical fertilizers are expensive and nobody can foretell what the position will be in the near future. For this and many other reasons the value of compost can never be overrated. Not only the farmer, but also his family, will benefit through compost, since it is an excellent method of combating flies. Manure pits and dung heaps are ideal places for breeding flies, but in a compost heap this is hardly possible owing to the high temperatures.

Nursery Quarantines.

The following nursery quarantines were in force on 1 August 1942:—

Subkleve's Nurseries, Johannesburg, on deciduous fruit trees (part), for pernicious scale.

Page's Nurseries, Franschhoek, on citrus (all), for red scale.

Rearing and Feeding of Chicks.

A. M. Gericke, Department of Poultry Breeding, Agricultural Research Institute, University of Pretoria.

THE rearing of chicks is a necessary undertaking on every poultry farm. The success of the enterprise can to a large extent be gauged by the quality of the chicks reared by a poultry farmer every year. Chickens are raised with the object of obtaining a fresh batch of pullets and table birds in order to replace, by younger birds, old hens which are no longer profitable producers and old roosters with declining fertility.

The success of poultry farming is largely dependent on the following: (*a*) the quality of the chicks, (*b*) quality of the producers, (*c*) quality of the feed given, (*d*) housing, especially during very cold or very hot weather conditions, (*e*) size and type of hopper used, and (*f*) management.

Rearing of Chicks.

The measure of success achieved will depend not only on the farmer's knowledge of poultry but also on his ability to apply that knowledge in a practical and effective manner. Consequently, a farmer may be considered an efficient manager if he has the knack of discovering and remedying a mistake before any harm has been done. So, for example, it would never do to allow the chicks to be exposed to cold for a few hours before lighting the lamps of the brooders. As soon as chicks become chilled, they refuse to eat, and begin to huddle together, trampling on each other, often with disastrous results.

Types of Brooders.

Various types of brooders are used for the rearing of chicks, viz.:—

(*a*) Cold brooders, in which the chicks are kept warm by suspending a cushion filled with feathers or chaff approximately 6 to 8 inches above the chicks.

(*b*) Canopy brooders, which may be coal or paraffin-burning or even electrically heated.

(*c*) Section brooder houses warmed by heat from a coal stove, conducted through pipes to the various sections of the house.

(*d*) Battery brooders made of metal or wood and provided with wire-netting floors on which the chicks are kept. This type of brooder is usually heated by electricity or a coal stove.

To-day cold brooders are generally used for the rearing of a small number of chicks, canopy or section brooders being required for larger numbers.

Generally speaking, it is important that the chicks should always get enough warmth to make them feel comfortable and contented. The temperatures required for the rearing of chickens are as follows:—

First week, 95 to 100 degrees F.
Second week, 90 to 95 degrees F.
Third week, 85 to 80 degrees F.
Fourth week, 80 to 75 degrees F.

These temperatues merely serve as a guide since the correct temperature must depend upon weather conditions and the behaviour of the chicks. When their sleeping quarters are too warm or too cold, the chicks tend to huddle together or to stand in small groups, and generally refuse to feed. When chickens are cold or when there is no feed in the hoppers, they cheep noisily, but when the temperature is correct and their crops are full, they are quiet and usually sleep squatting flat on the ground with their heads stretched forward.

Fresh air is just as important as warmth. Since fowls mature fairly rapidly, provision must be made for a regular supply of oxygen. When the lamps smoke and the house is too stuffy, chicks do not get sufficient fresh air, with the result that their vigour is greatly impaired.

Suitable Chicken Houses.

Briefly, a chicken house should conform to the following requirements, viz:—

It should be possible to regulate its temperature; provision should be made for adequate ventilation; the floor should be roomy and dry; the chicks should be protected against rats and cats, as well as against fire, and it should be possible to disinfect the chicken house without difficulty. Straw and shavings are usually placed on the floor as litter. Sand is not suitable because it is too heavy, and droppings usually adhere to the surface layer of sand.

The cost of constructing a concrete floor will always be justified. In the absence of a concrete floor, diseases like coccidiosis and insect pests, especially fleas, cannot be properly controlled.

As soon as newly hatched chicks are dry, they are taken from the incubator and placed in the brooder house. Heat is usually necessary for 6 to 8 weeks, according to weather conditions. At the age of 6 to 8 weeks the pullets are generally well covered with feathers which serve to protect the body.

The sexes must be separated as soon as the cockerels can be distinguished. In the case of light breeds, such as Leghorns, the sexes are separated when the chicks are 4 to 6 weeks old, while heavy breeds such as Austrolorps are separated at the age of 6 to 8 weeks. It is preferable that chicks of different ages should be kept apart.

When the chicks no longer require any artificial warmth, they may be transferred to an open run. Portable houses provided with wire netting or wooden floors are generally used for this purpose. These houses can always be moved to fresh ground. The chicks are confined to such a house for the first two days until they are accustomed to it. In this way they are also prevented from running about from one house to another.

In portable houses adequate provision should be made for ventilation. Shade is essential, especially during the hot summer months. A few trees in the vicinity of the house are ideal for providing shade.

For the successful rearing of chicks it is essential that the houses should be cleaned, especially with a view to controlling parasites and insects. For this type of work no definite rule can be laid down. Under normal circumstances, chicken houses should be cleaned once or twice a week. When a disease such as coccidiosis occurs, the house should be cleaned thoroughly every morning and repeatedly disinfected until the disease has disappeared. When the floor is wet after rain, the wet litter should be removed as soon as possible because young birds are sometimes prone to eat the wet litter, and this may have harmful results.

As a rule, chicks should feed before they are 48 hours old, but they can go without food as long as 96 hours because the absorbed yolk of the egg supplies the body with food for that period. It has been found, however, that the sooner the chickens eat the better the yolk will be digested.

A hopper, 3 feet long, 10 inches wide and 2 inches deep, is suitable for 100 day-old chicks. As soon as they are 2 to 3 weeks old,

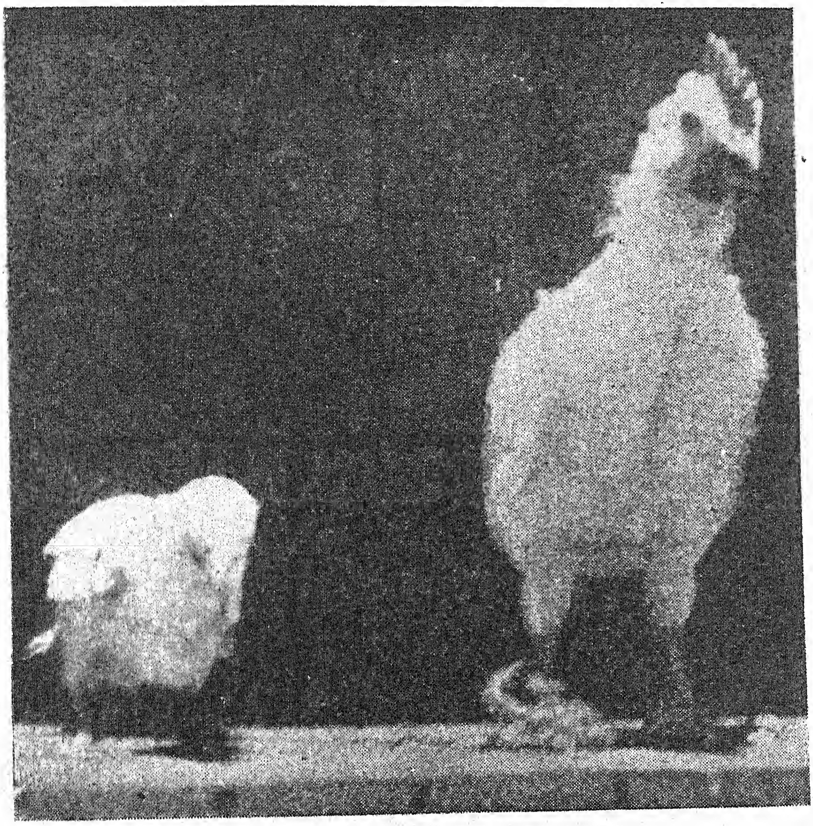

FIG. 1.—The difference between a normal and abnormal chick. The smaller chick is suffering from dermatitis, a disease caused by a deficiency of pantothenic acid in the ration. Both chicks are 5 weeks old.

a larger hopper must be made available. Adequate hopper space is of great importance as it will obviate overcrowding.

At the time of their being transferred from the incubator to the chicken house, chicks are still stupid and will not readily notice the food. A good plan is to place the food on a sheet of paper or old newspaper near the brooder at first so that they can easily see it.

An adequate supply of clean drinking water should be available from the first day. A fowl's body contains 55 per cent. water. Briefly, the function of water is to soften the food, to aid the formation of blood in the body, to eliminate waste products, and to regulate the temperature of the body.

The temperature is also regulated by the lungs. A chick has no pores in its skin nor much room for food in its stomach, with the

breastbones occurs in some blood strains than in others, and that this abnormal position is aggravated when chicks are allowed to roost on perches at a very early age. In many cases the perches are too sharp. To prevent the development of such abnormalities it is advisable to apply selection to breeding birds. Furthermore, the chicks should not be allowed to sleep on the perches at an early age, and when perches are used they should be wide.

Since *oatmeal* has a special nutritive value, it is at present extensively used in chicken rations. In certain experiments it has been found that by feeding oatmeal an abnormality known as slipped tendon or perosis can be prevented. As stated above, this condition is not due to a deficiency of calcium or phosphorus. The legs of the chicks contain sufficient calcium but are nevertheless crooked or badly bent. As a rule the knee-joint, and sometimes even the whole leg, is enlarged.

Bearse found that the feeding of oat husks prevents feather-eating and toe-pecking, a cannibalistic habit often found in chicks and young birds, especially if they are intensively kept in small runs without sufficient space for free movement, or if they are fed rations which do not contain sufficient nutrients. This beneficial effect of oats is said to be due to the presence of the mineral manganese.

The manganese content of oats as compared with that of several other cereals is as follows (in milligrammes per 100 grammes), viz., oats, 4.66; wheat, 2.91; barley, 1.19; and maize, 0.38.

Oats contain a fairly high percentage of fibre, especially when they are lean. Usually not more than 10 per cent. oatmeal is added to the mash ration. In cases where chicks peck at one another and/or eat feathers, it would perhaps be advisable to furnish them with oat husks in separate hoppers until such time as they have been cured of the habit.

Green Feed.—The mash should be supplemented by an adequate quantity of green feed. If available, skimmed milk should also be given in a separate hopper. When chicken-raising is practised intensively and direct sunshine is not available to the chicks, ½ to 1 per cent. cod-liver oil should be added to the mash as follows. The oil is added to a small portion of the mash and mixed to a crumbly consistency, after which this portion is thoroughly stirred into the remainder of the mash.

When chicks are raised in a battery brooder and receive no green feed or milk, provision must be made for *riboflavin, a growth-promoting vitamin*. A deficiency of riboflavin in the ration causes paralysis in the chicks, a tendency for their toes to curl inwards, poor growth and poor utilization of feed. Milk, yeast, liver meal, lucerne meal and green feed are good sources of this vitamin.

In the absence of milk or green feed in a chicken ration, 2 to 3 per cent. dried yeast may be incorporated in the ration to supplement the riboflavin deficiency. It should be clearly understood, however, that dried yeast is not always of the same quality. If inferior yeast is fed, definite signs of paralysis and curling of the toes will still be detected in the chicks. Chicks suffering from a deficiency of riboflavin develop paralysis of the legs at the age of 3 to 4 weeks. This is manifested at first in a tendency on the part of the chick to walk on its knees, followed ultimately by the curling in of the toes.

Brewer's Yeast.—Experiments conducted at the Agricultural Research Institute have revealed that green feed cannot supplement brewer's yeast as a source of riboflavin for normal growth in chicks. This is probably due to the fact that for the first three weeks of its life a chick is unable to consume sufficient green feed, its crop being too small at that stage.

Another nutrition-deficiency disease which sometimes occurs in chicks is known as dermatitis and is caused by a deficiency of pathothenic acid in the feed. Both riboflavin and pathothenic acid belong to the vitamin B_2 complex. Dermatitis, which generally occurs at the age of 3 to 4 weeks, is characterized by ulcers about the corners of the beak and a swelling of the eyelids, which adhere to each other, preventing the chicks from seeing their feed. In addition, the feathers of a bird suffering from this disease are ragged and its growth is impaired. Chicks which do recover make such slow growth that in most cases they are not profitable producers. Brewer's yeast, sugar-cane molasses and lucerne meal are good sources of panthothenic acid. Where dermatitis occurs, it is advisable to feed molasses since this is an inexpensive product.

FIG. 3.—A deficiency of riboflavin in the ration caused the chick to become lame and its toes to curl inwards.

Vitamins.—Vitamins A, B, and D are also necessary in the ration. A deficiency in vitamin A causes a form of "roup". Cod-liver oil, yellow maize and green feed are rich sources of vitamin A. Since chicken rations usually contain only 50 per cent. yellow maize, it is most important that the deficiency in vitamin A should be supplemented by adding green feed, cod-liver oil or lucerne meal of good quality. Lucerne meal prepared from young plants with a good green colour is excellent for this purpose. Generally speaking, it may be stated that skimmed milk and green feed are of immense value in chicken rations because of their high vitamin-content. For normal growth, chicks from 1 day to 6 weeks old require 700 units of vitamin A per pound of feed, while young turkeys require as much as 4,500 units. Farmers are therefore strongly advised to grow green feed for their chicks, as well as for laying hens and other poultry. If green feeds are unavailable during the winter months, from 2 to 3 lb. cod-liver oil, which is rich in vitamin A, should be mixed with 1,000 lb. feed.

A deficiency in vitamin B_1 causes young birds to lose the power of using their legs and wings for normal movement; this type of paralysis differs from the type caused by a deficiency in riboflavin. Wheaten bran and most cereal feeds contain vitamin B_1. Consequently, rations are usually not deficient in this vitamin.

Vitamin D is necessary for the assimilation by the body of lime and phosphorus. If this vitamin is absent, the normal development of the legs of chicks will be impairel. Cod-liver oil is a rich source of this vitamin. If chicks can be exposed to direct sunlight, it is not necessary to add cod-liver oil to the mash. In some parts of the

Union, particularly in the winter-rainfall areas, the sky is sometimes overcast for a week or more at a time, with the result that chicks do not get sufficient sunlight. In such cases it would be advisable to add ½ to 1 per cent. cod-liver oil to the ration.

Suitable Ration.—A ration for chicks, without wheaten bran and pollard, may be made up as follows: 50 lb. yellow mealie meal, 10 lb. maize germ meal, 15 lb. oatmeal, 10 lb. lucerne meal, 15 lb. fish meal, 2 lb. powdered oyster shell or limestone, 1 lb. bonemeal. Chicks are kept on this ration up to the age of 16 weeks, after which the following ration, which is also suitable for laying hens, is substituted: 45 lb. yellow mealie meal, 10 lb. maize germ meal, 10 lb. oatmeal, 10 lb. lucerne meal, 7 lb. meat meal, 13 lb. fish meal, 2 lb. bonemeal, 2 lb. powdered oyster shell or limestone and 1 lb. fine salt. This ration is supplemented by a grain feed in the form of yellow maize. If unavailable, the fish meal (7 lb.) may be replaced by 12 lb. baked soybean meal, in which case it is necessary to increase the bonemeal in rations intended for laying hens from 2 lb. to 3 lb.

The following table reflects the average quantity of feed consumed by fowls, ducks and turkeys.

Type of Poultry.	Age in weeks.	Normal weight, lb.	Quantity of feed consumed lb.	Lb. Feed required for every 1 lb. live weight.
Leghorn cockerel	12	2½	9·75	3·9
Australorp cockerel	12	3	10·1	3·7
Light Sussex cockerel	16	4·2	16·8	4·0
Duck	12	5·5	20·35	3·7
Turkey	12	3·0	9·6	3·2
Turkey	28	15·0*	64·5	4·3

Economic Requirements.

It is generally recognised that feed costs constitute approximately 60 per cent. of the total production costs. Producers sometimes fail to kill cockerels at the best marketable age. To keep cockerels intended for slaughter purposes for longer than 18 to 20 weeks does not appear to be economical. The period of growth consists of (1) a period of accelerated growth, when the rate of growth keeps pace with the gain in weight, and (2) a period of retarded growth when the rate of growth decreases while the gain in weight increases.

It is therefore unwise to decrease the quantity of feed or to feed a poor ration. A much better policy is to finish off the birds for the market in as short a time as possible, to keep the rate of mortality as low as possible and to retain birds which effectively utilize vegetable feeds for the production of food for human consumption.

The successful rearing of chicks is the basis of progressive poultry-farming. If chicks are in poor condition, their growth is slow and mortality is likely to be high and profits limited. Furthermore,

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The Production of Root Seeds.

W. Schultz, Lecturer in Field Husbandry, Cedara.

IT is necessary to-day for the Union to produce its own seed supplies for root crops such as rape, kale, turnips, swedes, chou-moellier and mangels. These " farm roots ", as they are generally known, are highly valued as succulent and nutritious stock feed, and produce a heavy tonnage per morgen.

In the past, root-crop seeds were imported owing to the existing idea that imported seed is superior to locally produced seed. Consequently, very few farmers were prepared to undertake seed production on account of the lack of demand.

For this reason the technique of seed raising under our own conditions has never been carefully studied, so that the present emergency finds us unprepared. Importation has already been reduced to such an extent that, unless we can produce most of our own requirements, we may find ourselves in a serious dilemma as far as these crops are concerned. It is therefore intended to discuss in this article the principles underlying successful seed production. This will serve to emphasize the problems connected with the undertaking and to indicate certain directions in which the farmer may move with safety in regard to seed production.

Growth Habit.

Before technical details are discussed it should be made clear that all farm roots are biennials, e.g., they require two seasons or portions thereof to produce their seeds. During the first season leaves and stems and, in the case of turnips, swedes and mangels, tubers are developed, whilst only during the second period of growth are the seeds formed.

Under South African conditions rape, kale, and chou-moellier, but particularly rape, appear to behave as annuals, e.g., the break between the first and second stages of growth is hardly noticeable. This is due, no doubt, to more continuous growing conditions than are found in colder countries.

In so far as climate is concerned, the farm roots, with the exception of the mangel, require a comparatively cool, growing period and, owing to their frost-resistant capacity, are treated mainly as winter crops in this country. Hence they are also referred to generally as " winter roots ". To grow them successfully, irrigation or adequate rainfall is necessary. Mangels, although frost-resistant to a certain degree, are partial to hot and dry conditions and are therefore regarded as a summer crop.

Winter roots, when grown during hot weather, are very subject to attack from aphids and the so-called cabbage or diamond-back moth, and they are also liable to be destroyed by cabbage-rot and black-leg.

From the point of view of seed production, excessive heat is equally undesirable as it interferes with the reproduction process. The most suitable conditions for winter roots and the raising of their seeds will be found in the higher middleveld and highveld areas where the climate in late summer and early spring is comparatively cool. Mangels, however, can be grown successfully at lower altitudes,

although in their case too, excessive heat, especially if associated with high humidity, will become a limiting factor. Looked at purely from the angle of seed production it would seem that the middleveld and lower highveld provide the right environmental conditions for mangels.

Methods of Seed Production.

The following methods, each of which is subject to modifications, are generally used in the production of seeds of biennial roots:—

(*a*) A portion of an ordinary crop is left standing throughout the winter to produce seed the following summer or, as in the case of rape and sometimes also kale and chou-moellier, even during the same winter.

(*b*) Fully developed plants selected from an ordinary or specially grown crop may be stored during a portion or the whole of winter and planted out in spring for seed production.

(*c*) Seed is sown at a special time with the object of producing small plants or roots which are utilized in a special manner to produce seed.

The first method is undoubtedly the easiest and cheapest, but also the least satisfactory from the point of view of selection, although considerable success can be achieved by the removal of undesirable plants.

In the second method, plants can be carefully selected in regard to general health, shape and vigour, but labour becomes an important consideration.

Apart from these considerations, however, both methods are practicable for general farm purposes since they do not require any special skill such as is needed in the third method which entails expert handling in storing and planting out of young plants or roots.

Under South African conditions the production of rape, kale and chou-moellier seed would have to be along the lines of the first method, and the same would apply to turnips which, owing to their pithy flesh, do not store well out of the ground. Swede seed could be raised according to the second method, but satisfactory results can also be obtained from the first; i.e., these crops should be planted at the correct time and allowed to stand until their seed has matured without being subjected to grazing or utilization in any other manner. The roguing, e.g., elimination of weak and otherwise undesirable plants, is strongly recommended in order to obtain seed of as high and uniform a standard as possible. The seeds are produced in pods and when these have taken on a yellowish colour they should be picked off the plants, cut with sickles or knives, and subsequently threshed with sticks or flails. Cutting of the plants is best done early in the morning while the dew is still on them, as this prevents shedding of the seed.

For the raising of mangel seed the second method is advisable as it produces a more uniform type of seed. In this case full-grown roots are selected from an ordinary "feed" crop, special attention being paid to soundness and shape. These roots are lifted very carefully and, after removal without injury to the "crown", are stored away in a dry, well-ventilated shed where they are protected from frost. In spring, when the danger of late frosts is over, the roots are planted out into a well-prepared field. The distance between the rows should be sufficiently wide for safe cultivation, but in the rows the spacing can be fairly close. Irrigation or adequate

rainfall is necessary to give the roots a good start. Planting may be done by making furrows with a suitable plough or by digging individual holes; the roots should be completely covered with soil.

When the plants begin to send up their flowering stalks it is advisable to cut a small piece off the main shoot, as this prevents the plant growing too tall and also encourages the development of lateral shoots. The harvesting of the plants by means of sickles or knives should take place only when the seed heads are nearly black and dry. The stems or plants are made into bundles, and stacked into small stooks and allowed to dry until ready for carting and threshing.

Where a crop of mangels is left in the ground during winter with a view to seed production, as outlined in the first method, the roots should be well earthed up after all undesirable types have been removed. To these belong in particular the so-called "bolters", i.e., plants which have sent up flowering stalks during their first growing period. This removal of "bolters" would naturally also apply in the case of swedes and turnips. With rape, kale and chou-moellier very early flowering plants are also best taken out, as their seed is liable to produce plants with little foliage. It is generally maintained that locally produced seed of all the farm roots is inclined to produce sparse and very early maturing crops. From the feeding point of view, this is naturally a disadvantage. Farmers with experience maintain that such locally grown seed should be stored for a year after which it will be equal to imported seed. In view of the scarcity of root seeds, it is essential to make sure that the crops, whether planted for seed or feed, will have the best growing conditions, and special attention should therefore be paid to the following points:—

Planting.

(1) *Soil and Seed-bed.*—The soil should be of an open type and well drained, especially for the tuber-forming crops. Ploughing should be thorough and as deep as the top soil permits on shallow soils. The seed-bed should be fine and firm, and sufficiently moist at the time of planting to assure germination and to prevent the young seedlings from being scorched. A good moisture supply also prevents burning of the seed through contact with fertilizer.

(2) *Time of Planting.*—Winter roots should not be planted during the hottest period of the year, nor should their main growing stage fall within this period. The safest times for the different crops are:

Highveld—

Rape, kale, chou-moellier and turnips: End of *January to middle of February.*

Swedes: *End of December to beginning of January.*

Middleveld—

Swedes: *Middle of January to beginning of Ferbuary.*

Turnips: *February (middle to end).*

Rape, kale and chou-moellier: *February-March.*

Mangels: *From October, in cold areas, to January, in warmer parts.*

(3) *Method of Planting.*—Planting should be shallow. Where a maize planter is used, and seed and fertilizer are mixed, the mixing should take place on the day of planting as burning of the seed will

result if seed and fertilizer remain in contact for as short a period as two or three days. Light soils should be rolled after planting.

(4) *Fertilizing.*—Farm roots are gross feeders and should receive dressings of kraal manure or compost (20-40 tons per morgen) as well as an application of a suitable root fertilizer (Grade F) in quantities of from 800 to 1,200 lb. per morgen. This treatment on a small area will be more profitable than lighter dressings over larger areas.

(5) *Thinning.*—Apart from rape which is sown broadcast, all farm roots are planted in rows. When the plants have reached the four-leaf stage, they should be thinned in the rows as follows:—

Turnips and swedes 8 to 10 inches apart.
Mangels, kale and chou moellier: 12 to 15 inches apart.
Thinning at a later stage results in reduced yields.

(6) *Transplanting.*—In order to save seed, farm roots are sometimes sown in seed-beds and the young plants transplanted into the field. Likewise, thinnings, i.e., plants removed during the thinning of a crop, are often used for transplanting. Only kale, chou-moellier and mangels are really suitable for this purpose. Transplanting should be done into a moist soil and preferably on a damp or drizzly day so as to ensure a quick " take ".

Insect Pests and Diseases.

As has already been pointed out, aphis and cabbage worms are a menace to farm roots, particularly in hot weather such as might be experienced occasionally in late summer and early spring. In the raising of seed the control of these pests is essential, and it can be effected for aphis by promptly destroying worthless plants, avoiding a succession of cruciferous plants, using clean transplants only, keeping the plants vigorous and spraying infested plants with tobacco extract, or nicotine sulphate with soap, or Derrisol. Prompt action is very necessary as serious damage can be done in a short time.

For the cabbage-moth caterpillar either dusts or sprays may be used, e.g.:—

(i) Dusts: (*a*) Dry pyrocide, or (*b*) cryolite.
(ii) Sprays: (*a*) Derrisol 1:300, or (*b*) lead arsenate 2 lb. to 40 gallons of water.

In applying liquid insecticides, the stirrup pump will be found useful, while for dusting a special duster is necessary.

The control of diseases like black rot (cabbage rot), and black leg is more difficult, and entails long crop rotations with non-susceptible crops. Immediate destruction of discarded plants is essential and the sterilizing of the seed in corrosive sublimate provides a good preventive measure.

Popular Bulletins.

(1) Calf Rearing—Bulletin No. 224. Price 3d. Obtainable from the Editor, Department of Agriculture and Forestry, Pretoria.

(2) The Export of Fresh Grapes from the Union of South Africa during the Ten-year period, 1930-39—Bulletin 225. Price 6d. Obtainable from the Chief, Division of Horticulture, Pretoria.

(3) Soft Cheese as a Food—Bulletin No. 229. Price 3d. Obtainable from the Editor, Department of Agriculture and Forestry, Pretoria.

Control of Dodder on Grazing.

The Use of a Blow-lamp.

J. A. Dreyer, Chief Weeds Inspector, Bloemfontein.

DODDER is a well-known parasitic weed in South Africa. Farmers who grow lucerne must at some time or another have noticed this weed which is entirely dependent on other plants for its continued existence. The dodder plant lives by twining itself around the stem of a suitable host into the tissue of which it pushes small suckers (haustoria) in order to absorb nourishment. The host is so weakened by the draining of its food supplies that it either dies or becomes stunted in growth.

FIG. 1.—The blowlamp in action.

Occurrence and Distribution in the Union.

Although dodder is primarily a weed which infects lucerne lands, it also occurs on grazing where it has spread to such an alarming extent during the past few years that there are areas in the Union to-day where several hundreds of morgen of grazing have been damaged by the plant. Indeed, the most serious infestations are now to be found on grazing and not on lucerne lands.

Dodder on veld often occurs along rivers—not only along the banks but also on the adjoining "vleis" and hills where it has probably been spread by birds which frequent the rivers. The most important rivers in this respect are the Sundays River, Gamtoos River, Fish River, Koonap River, Kat River, Oorlogspoort River, Doring River, Brand River, Caledon River, Vaal River, Loop Spruit, Modder River and Skoon Spruit. The following are the principal districts affected, namely, Graaff-Reinet, Venterstad, Colesberg,

Oudtshoorn, Calitzdorp, Ladismith, Swellendam, Barrydale, Riversdale, Ladybrand, Potchefstroom and Zoutpansberg. Minor infestations also occur in many other districts. So far as is known, more than 300 morgen of grazing in the Union are infested with dodder.

The Danger of Dodder on Grazing.

(1) Since dodder (*Cuscuta campestris*) attacks not only lucerne but grazing as well, the eradication of the parasite on lucerne lands alone will not be completely satisfactory owing to the constant danger of lands being re-infested by seeds from plants growing in the veld.

(2) On a farm in the Colesberg district specimens were collected of all plants found to be parasitized by lucerne dodder. The specimens included: One lucerne plant, one clover plant, five grasses, four kinds of karoo bush and fourteen other plants and species of weed. The investigation therefore showed that dodder attacks useful karroo-bushes, grasses and other nutritive plants. The growth of such plants is retarded and the value of the grazing considerably reduced. Furthermore, animals are averse to eating dodder, and consequently avoid infested plants.

Control.

Dodder is spread mainly by birds and water and by the use of infested lucerne seed and hay. Care should be taken to ensure that lucerne seed and hay are free from dodder. If any doubt exists regarding the purity of lucerne seed, an eye should be kept on the lands for any possible dodder infestations. Should small patches of dodder occur, these may be covered with straw and burnt.

Control by Means of a Blow-lamp.

In cases where dodder encroachment has already assumed serious proportions, vigorous measures are necessary. In an attempt to find some practical method of eradication, experiments were conducted with a blow-lamp in order to control the weed. The object of these experiments was to determine whether dodder could be effectively destroyed by means of a blow-lamp and whether this method would prove practicable. For the purpose of the experiment pieces of veld were selected and pegged off. One plot (*a*) consisted of veld completely infested with dodder, and the other (*b*) contained patches of dodder from 1 to 3 feet in diameter and from 1 to 10 yards distant from one another, i.e., the conditions were typical of veld in an early stage of infestation.

The dodder had not yet reached the seeding stage; the stand and the height of growth were moderate.

Results.

(1) According to the experiment and the calculations made, 50 gallons of power paraffin and 75 working hours will be required to destroy one morgen of dodder where the veld is completely overgrown with the weed. If the cost of the fuel is reckoned at 1s. per gallon and that of the labour at 3s. per 9-hour day, the total expenditure will amount to £3. 15s. per morgen.

(2) Where the dodder stand is as described in (*b*), it has been found that 2 gallons of fuel will be required and that the work can be done in 3 hours, i.e., at a cost of 3s. per morgen.

It would therefore appear as if the expense involved in eradicating dense dodder infestations which completely cover several morgen of veld is too great to warrant the use of a blow-lamp. A suitable spray would probably be cheaper.

When conditions are as described in (*b*) excellent results are obtained at trifling cost with the use of the blow-lamp which would prove effective even where infestations are somewhat denser.

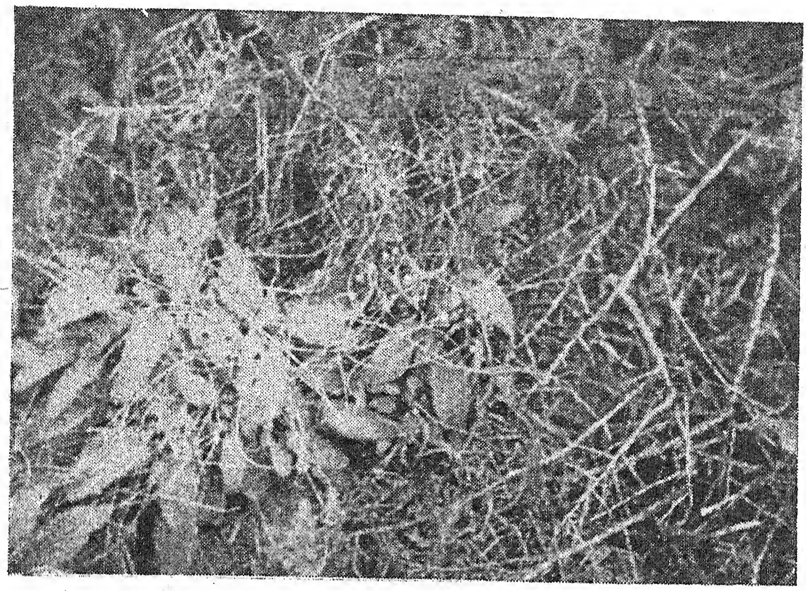

FIG. 2.—Sage infested with dodder; early stage.

It is quite unnecessary, however, that dodder should spread to the extent described in (*a*). As soon as the weed is observed it should be combated and not allowed to develop into large patches.

Hints for the Successful Use of the Blow-lamp.

(1) Dodder should be burnt immediately its presence is detected. The sooner steps are taken, the smaller will the infestation be and the lower the cost of combating it.

Dodder seed usually germinates about a month after the first summer rains.

(2) A considerable saving in fuel can be effected if all patches of dodder are marked beforehand with a stake or flag. This plan will not only enable the operator to move rapidly from one infestation to the next without loss of time, but will also eliminate the possibility of any patches of the weed being overlooked.

(3) The length of time that the flame should be directed at a particular patch will depend on the stage of growth of the weeds and the density of the plant-host stand. When dodder has already run to seed, the plants should be subjected to the flame for a longer period so that the seeds may be rendered harmless. This also applies to dodder on densely-growing plant hosts since all the shoots must be destroyed.

If the plant hosts are only moderately dense and the dodder has not yet run to seed, the flame need not be directed at one spot for longer than two seconds.

The patch burnt should extend slightly beyond the area in which the dodder is visible in order to make quite sure that all dodder shoots have been scorched.

(4) Save fuel by not burning too early in the morning while the dew is still on the veld. Hold the flame as closely as possible to the dodder and avoid working on windy days, otherwise a considerable amount of heat will be lost.

(5) Carefully follow the instructions given on the blow-lamp, maintain the correct pressure and keep the flame burning steadily.

Farmers who have used the blow-lamp, are highly satisfied with the results. It is useful also for controlling dodder in lucerne lands.

The apparatus which can be handled by one person, is simple and convenient for destroying dodder in the veld. If 2 gallons of paraffin are poured into the fuel container, the operator can work uninterruptedly for 3 hours. With an additional 2 or 3 gallons for refuelling, the operator will have enough to last the whole day. Another advantage attached to the use of the blow-lamp is that dodder may be destroyed in one operation. It will be necessary, however, to go over the veld several times in order to destroy plants which may have sprung up from seeds which germinate later. The blow-lamp may therefore be used with great success for controlling dodder if care is taken that the weed is combated in the early stages of growth before serious encroachment has taken place.

Produce more Food.—

[Continued from page 546.

order to make good any shortage. The normal supplies of commercial fertilizers, spraying and dipping materials, implements, machine accessories and similar requirements are unobtainable. The farmer will therefore be obliged to employ new methods and unusual production requirements and will have to exercise every care to use these requisites sparingly and effiiciently. The Controller of Food Supplies is doing everything in his power to obtain farming requisites. It is the duty of the producer to remain in intimate contact with the Department of Agriculture and Forestry in order to become acquainted with the production methods which are being recommended. The agricultural colleges and the extension services are assisting producers with advice on an unprecedented scale. If farmers organize efficiently and constantly inform the Food Controller of their problems and of their requirements, the necessary advice will be given and the Controller will do his utmost to assist them in obtaining their production requirements.

The producer is on a good wicket at present. There is a great demand for food products and the nightmare of having to scramble for a market has disappeared. The Food Controller sees to it that fair prices prevail, assists in obtaining farming requisites and supplies information on the soundest methods of production which can be used.

Whatever differences of opinion we may have, on the question of food supplies there can be none. We must have enough and to spare for every person in our country. Here is an opportunity for National service in which everybody can and must take part.

(Dr. J. S. Marais, Director of Publicity, Food Control Organization.)

Sterility and Reduced Fertility in Cattle.

H. P. Steyn, Onderstepoort.

THE problem of reduced fertility and obsolute sterility* is a major factor in cattle breeding. It is a more serious problem in dairy than in beef breeds, but even in the latter it may cause considerable losses. Some idea of the importance of breeding inefficiency can be obtained from four surveys, the results of which were published in England by Graig during 1936. In these surveys the reasons for the disposal of cows from dairy herds were investigated and it was found that 24 per cent. of the disposals were caused by sterility and abortion and approximately 9 per cent. by mastitis. From America it has been reported that sterility may result in a 20 per cent. wastage from the entire herd. Unfortunately, no statistics are available for the Union, but every experienced dairyman knows what inefficient breeding, whether caused by temporary infertility or permanent sterility, may cost him in reduced calf crop and milk yield.

The process of reproduction is exteremely involved, and this fact can be truly appreciated only when one endeavours to find the reason or reasons for the inability to reproduce under any particular set of circumstances. The difficulties sometimes experienced in explaining the cause of lowered fertility in a herd may be better understood when it is realized that the ability to breed and reproduce normally is not dependent only upon the condition of the genital organs, but is as much dependent upon the general health of the animal and early development of the calf. Furthermore, the normal functioning of the genital organs is controlled by organs otherwise entirely unrelated to them. The most important of these organs is a small body situated in the brain and known as the *anterior pituitary*. In short, maximum fertility can only be expected from healthy, well developed and correctly fed animals. The reasons for this statement will become more apparent as the factors influencing fertility are outlined. The problem immediately becomes more difficult when one remembers that herd infertility is largely, often entirely, attributable to the bull.

It is impossible to deal here with all the causes of infertility and sterility, so that only the essential factors influencing fertility can be outlined and explained briefly, so as to enable the cattle farmer to get a fair perspective of a problem which so vitally affects his business. It is therefore proposed to discuss general factors influencing fertility before dealing with the most important affections of bulls and cows which may impair their ability to breed.

Nutrition.

It has been definitely proved that proteins, certain mineral elements, and vitamins are essential to normal reproduction, and therefore provision is made for the inclusion of adequate quantities of these constituents in all properly balanced rations. It is, however, important to indicate how improper feeding in a general way can affect fertility.

* As used in this article: *infertility* is used to indicate reduced ability or temporary inability to breed, whereas *sterility* is used only to describe permanent inability to reproduce.

Improper feeding of calves and various calfhood diseases may later affect their breeding efficiency. The influence of correct feeding of calves on their fertility as adults will be better appreciated when it is understood that the development of the genital organs is by no means ended when a calf is born. This development is probably not completed until shortly after the first heat in heifers, and it may be very seriously impaired by ill-nutrition and calfhood diseases. These influences are particularly important during the first few months of the calf's life. The so common tendency to "economise" on calf feed is therefore a penny wise policy. If the feed bill is excessive the calf should not be made to suffer. It would be wiser to keep a smaller number of the best calves and feed them properly.

Under the usual conditions of feeding dairy cows in the Union there is not likely to be a deficiency of any mineral or protein if a properly balanced ration of concentrates is fed. A point which requires stressing, however, is that the requirements of a pregnant cow are somewhat higher than that for maintenance alone. As an illustration of this fact it has been stated that the protein requirements of a pregnant cow are 17 per cent. above maintenance. This increased demand will probably be met by the usual ration of dairy cows.

Vitamins.—This discussion would not be complete without mention of the new "fashion" in feeding, viz., *the vitamins*. The exact significance of the vitamins in maintaining fertility in farm animals is not known. Some very spectacular results have been obtained in experiments with rats, but these results are not directly applicable to farm animals. The lack of *vitamin E*, which has come to be almost generally known as the "anti-sterility factor", probably plays no part in causing infertility in cattle, and even if the absence of this vitamin would cause infertility it is a deficiency which is never likely to arise, as the vitamin is present in most feeds ordinarily given to farm animals. The almost universal presence of vitamin E in animal feeds is the greatest obstacle in carrying out properly controlled experiments to test its significance in farm animals.

Vitamin A is produced in the animal body from a substance called carotene which is present in green plants, and a deficiency of this vitamin may occur under certain conditions. Carotene is present in sufficient quantities for the needs of cattle in hay of good quality, but it is absent from poor, bleached hay and dry grass. For this reason a deficiency of the vitamin may occur during severe droughts and possibly even during the worst winter months. Fortunately, cattle store a considerable reserve of this vitamin in certain body-organs, especially the liver, and have not been known to suffer from a serious deficiency of vitamin A under our usual conditions of farming. The first symptoms of a vitamin A deficiency in breeding cows is that calves are born dead or weak and that the afterbirth may be retained. The latter symptom, frequent retention of the afterbirth, is quite a common condition, and farmers generally state that they experience most trouble from retained afterbirths during the driest time of the year until the first good rains have fallen. As yet we have no proof that a vitamin A deficiency is the cause of this condition in the Union, but from the foregoing facts it seems probable that it may be. It must, however, be remembered that the commonest and most troublesome cause of retained afterbirth is undoubtedly contagious abortion.

In bulls a vitamin A deficiency has been proved to cause retrograde changes in the testicles with resultant sterility. If the

deficiency has not been too severe, recovery will take place, otherwise the sterility may be permanent.

Some Physiological Aspects.

In many instances bulls or cows may be infertile as a result of some disturbance in the normal body functions, without any obvious signs of disease. This type of infertility is usually due to a derangement of the normal relationship between the organs which control sexual function. Sexual functions, e.g., " heat ", the interval of rest between " heat " periods, etc., are not automatic, but are the result of the active control exercised by certain organs, most important of which are the *ovary* and the *pituitary gland*. Similarly, the desire in the male to serve, is controlled by the *testicles* and the *pituitary*. Disturbances in the normal functioning of these glands are common, and although the nature of these disorders has not yet been fully explained, a great deal can be done to correct them. Although these disorders are of great practical significance their explanation would be of a too highly technical nature to undertake here, and only those aspects which are of the most practical nature can be dealt with.

The usual way in which these disorders manifest themselves is in an irregularity of the sexual functions, i.e., a cow or heifer does not become pregnant in spite of service, but she returns to the bull at irregular intervals which are either abnormally long or abnormally short. It is of great assistance to the veterinarian if accurate information of this nature can be given when a herd is being examined, as it materially assists him in making a correct diagnosis and prescribing the best treatment. A cow should come in heat approximately every 19 to 21 days, and although heat may be very short it usually lasts about 24 to 36 hours. Normally, heat does not last for several days in the cow as it does in the mare. Prolonged bulling is abnormal. Farmers often report that a cow was seen to discharge a small amount of blood after having been in heat. This is normal, and although " bleeding " does not always occur, its presence does not mean that the cow is not pregnant if she has been served.

All sheep and horse breeders are aware of the fact that their ewes or mares have very definite breeding seasons. What may be called " out of season " lambs and foals are born, but if an attempt were made to have the whole lamb or foal crop changed from the normal season the results would be disastrous. This seasonal nature of breeding in sheep and horses is not a peculiarity of these species, but is seen in a more or less marked degree in all species of mammals. In cattle, fortunately, this seasonal breeding is not so marked as in many other species, but the same tendency is often a cause of difficulty. It is really only domestication and improvement by selection which has largely overcome seasonal breeding in cattle, and it is therefore not surprising to find that cows and heifers often " return to the bull " during late winter and early spring. This, then, is the season of sexual rest in cows and heifers. As often happens, it is the period during which dairymen become most perturbed about their cows " not taking ", and unfortunately, it is the most difficult time to treat infertility successfully. Some heifers and cows persistently return to the bull after the winter and they require special treatment before they become " settled ".

The Bull as a Cause of Infertility.

When a farmer reports that his cows are not calving he seldom thinks of giving any information about the bull or, if he does, the

usual story is that he has had the bull for a fairly long period, and found him to be quite fertile and still serving well. It should be emphasized here that this does not exonerate the bull. On the contrary, this description is so common in cases of infertility of bulls that it immediately makes one suspicious.

Not until recently was attention paid to the bull when seeking the causes of infertility in a herd. This was followed by the belief that if the bull got calves he was fully fertile. The latter belief is entirely wrong. A bull may be of low fertility, i.e., he may only get a percentage of perfectly normal cows in calf; he may become temporarily infertile; or he may be highly fertile and then become infertile or lowly fertile. Furthermore, it is not an exaggeration to say that the bull is more often to blame for herd infertility than the cows. This can be more readily understood when it is remembered that the only conditions which can render a large number of cows and heifers infertile or decrease their fertility are a few infectious diseases, nutritional defects and seasonal effects. Infectious diseases are usually easily recognized by their fairly sudden appearance or by abortions, whereas nutritional disturbances are not likely to affect the herd suddenly, unless there has been some drastic change in the feed of the herd, and the effects of season are usually only seen during late winter and early spring.

The exclusion of seasonal effects as a cause of infertility in a herd is not an easy matter for the farmer, because it is very often under these conditions that the bull becomes infertile. The reason for this is that because of the number of "returns" the bull has to perform a larger number of services than usual and he becomes overworked, thus impairing his fertility. In this connection it must be remembered that the inclination to serve is not an index to a bull's fertility, although usually the overworked bull loses some of his accustomed vigour and keenness.

It is often an extremely difficult matter for the veterinarian to decide whether a bull is infertile or lowly fertile. Absolute sterility can usually easily be determined, but a diagnosis of reduced fertility must very often be made from circumstantial evidence after having completed an examination of the whole herd and the bull. This makes it evident that the cattle owner can be of very great assistance by furnishing full and accurate information. Naturally, only the man who keeps records would be in a position to do so.

Requests for advice about infertility in herds are frequently received. From the foregoing it is, however, obvious that really reliable advice is often impossible without a personal examination of the herd. Occasionally, samples of semen from bulls are sent in for examination, and here again, it is only in those cases in which the method of collection of the semen has been correct that a definite statement about a bull's fertility can be made, provided a full history of the bull's breeding record is given.

Some Common Conditions Causing Infertility in Bulls.

Unfortunately some conditions causing infertility in the bull do not produce any visible signs whereby they may be recognized by the layman, but mention may be made of some of the more obvious causes of infertility.

The commonest causes of infertility and reduced fertility are probably improper care and feeding, and over-work. The question of *nutrition* has already been discussed, and it is sufficient to emphasize the necessity for paying special attention to the feed of the bull

because of his particular importance in the herd. The bull should be the best fed animal in the herd, but by this quality not quantity is referred to. The bull must have a properly balanced ration and provision must be made to include some fresh green feed in his ration at all seasons of the year. Ensilage will not serve as a substitute, as it has been reported that ensilage has been suspected of being the cause of infertility in bulls. Ensilage may be fed but not in unlimited quantities. Remember that the bull is not fed for milk production, as are the cows, but must be kept in good hard working condition.

Correct feeding alone will not keep the bull in the desired condition; *exercise* is very important. It has been proved that if a correctly fed bull is confined and not allowed exercise, his fertility soon becomes impaired, whereas allowing exercise brings about improvement. No definite rule can be laid down about the amount of exercise which is necessary, but merely allowing a bull into a small exercising pen outside his stable is not sufficient. If provision for a fairly large camp cannot be made the bull should be led out for a two mile walk every day.

"*Overwork*", i.e., allowing a bull too many services, is a common fault. A bull's fertility is most easily affected by overwork while young. A young bull may be quite capable of serving a fairly large number of cows successfully, but this may very seriously affect his usefulness later. No young bull should be put to full use before he is about two-and-a-half years old and 16 to 18 months should be regarded as the minimum age at which to start using a bull. Naturally, the ages mentioned can be varied somewhat with different breeds and with individual animals. Size, however, is no index of the maturity of the bull for breeding purposes and it is much safer to be guided by age than by other factors. Caution in the use of the young bull will pay handsome dividends.

Overwork affects adult bulls too, but it is difficult to state definitely what number of cows should be allotted to a mature bull because individual variations are tremendous and the method of service is all-important. If hand service is practised, and this is certainly the best method, many more cows can be allowed a bull than otherwise. In practising hand serving the usual method is to allow each cow one or two services. Two services are not essential if the bull is highly fertile and is being used regularly.

The advice usually given is that a bull can serve 50 to 100 cows when serving throughout the year. This statement is misleading as it is the number of services which the bull must make which are important. If, for instance, a large number of cows "return", a bull may not be capable of successfully serving even 50 cows during a year, whereas he could comfortably serve 100 if only one service per cow was allowed. As a general rule a mature healthy bull may be allowed an average of three services per week throughout the year. In practice this may mean that during some weeks more than the average number of services are allowed, whereas during others there may be fewer than the average or none at all. Under no circumstances, however, should a bull be expected to serve a cow every day over an extended period, nor should a number of services vary much greater than that recommended be allowed for any length of time. One service a day for a week would reduce a bull's fertility temporarily. The fact that a bull which has been fertile, and if subjected to a period of overwork, may become infertile or lowly fertile explains the common experience that it is usually after a period

of increase in the frequency and number of services, such as may occur during late winter, that complaints about herd infertility are received.

Under ranching conditions, where a comparatively large number of cows must be served in a short time and when bulls are allowed free range with the cows, the number of cows which can be successfully served is very much smaller than when services are controlled and spread out over the whole year. Under these conditions 3 to 4 bulls should be allocated to 100 cows to obtain the highest degree of fertility.

When young bulls of 18 months old are first allowed to serve they should not be allowed more than the average of about one service per week and this number can be gradually increased as the bull gets older.

The bull is always a very important item of expenditure in any herd and for this reason the farmer is forced to manage with as few bulls as possible. If this had not been so the common fault of over-working the bull would not exist; but in economising in the number of bulls farmers would do well to consider increasing the serviceability of their bulls and in this way reducing expenditure, instead of being forced to replace bulls at short intervals. If the desired number of good bulls cannot be afforded it would be better to supplement the number with one or two cheaper bulls and grade the cows so that the better cows only are allotted to the best bulls.

Diseases Causing Infertility in Bulls.

There are also a number of diseases which may cause infertility or sterility and which are of a sporadic nature and often unavoidable. The most important of these are: contagious abortion, inflammation of the testicles, injuries and inflammation to the sheath and penis, lack of desire to serve either as a result of some obvious lesion such as sore feet, joint troubles, overwork or some inherent defect, etc. With the exception of contagious abortion and diseases of the internal genital organs, the cattle owner is usually able to see that there is something wrong with the bull and often diagnoses the disorder himself. These conditions, therefore, do not need any further description.

Contagious abortion is a common cause of reduced fertility and is diagnosed by the familiar blood test. More will be said about the significance of this disease when the diseases which cause infertility in cows are dealt with in a subsequent article.

Reduced fertility in the bull can usually only be diagnosed by the veterinarian after a personal examination of the whole herd including the bull and with the aid of a full and accurate history of the herd. Absolute *sterility*, on the other hand, can often be quite easily diagnosed by means of at least two examinations of semen from a bull, provided the semen has been properly collected. There is no great difficulty about making a proper semen collection for this examination once one has had a little instruction in the method of collection, but this cannot be described here.

Grow More Legumes.

Dr. A. R. Saunders, Deputy-Director of Production, Food Control Organization.

THE shortage of protein-rich concentrates and the difficult position which obtains in regard to fertilizer supplies, especially that of nitrogen, make it imperative that more legumes should be grown. This does not imply that more land should be put to the plough, but rather that a greater proportion of the soil at present under cultivation should be sown to legumes, for the higher yields of maize and other crops following the legume can, under proper conditions of cultivation, be made to compensate for the smaller area available.

Even on soils, where nitrogen in artificial form evokes no response, the growing of legumes generally has a beneficial effect on soil productivity. This effect may be due to a variety of causes, amongst which a significant one is doubtless the fact that legumes are apparently able to make better use of natural phosphates in the soil than most non-leguminous plants. The roots of legumes are particularly rich in phosphorus, and when they decay the phosphorus becomes mineralized into a form available for the succeeding crop. It does not follow, however, that in a system of crop rotation, where legumes play an important part, the addition of phosphates can be dispensed with, but rather that good results can be obtained with smaller quantities. In the present time of scarcity this is a matter of the utmost importance.

Beans.

The best type of legume to grow will depend largely on soil and climatic conditions. In certain areas the various kinds of common beans, such as haricot, kidney and sugar, are already important crops, and farmers are well acquainted with the best methods of production. A common practice in harvesting these beans is to pull the plants by hand when they are mature. From a soil-fertility point of view this method has the obvious disadvantage that a large proportion of the roots is removed from the soil. Wherever possible the plants should preferably be cut off above ground-level by means of sharp hoes or other tools.

Although the dry stems and husks of beans grown for seed are of some value as animal feed, their protein-content is too low for purposes of compounding a reasonably well-balanced ration, and especially in the feeding of dairy cows, leguminous hay of good quality is indispensable unless the protein requirements can be met from other sources. Such sources are daily becoming more limited, and farmers have perforce to rely on their own supplies to an ever-increasing extent.

Cowpeas and Soyabeans.

Apart from lucerne the most important legumes for hay are cowpeas and soyabeans. In the main, cowpeas are best suited to the drier parts of the summer rainfall area and soyabeans to the high rainfall localities. Both crops have the same high feeding value when cut at the right stage and properly cured. Their soil requirements are approximately the same as for maize, and although they respond well to phosphatic fertilizers it is suggested that such

quantities as are available be used on the non-leguminous crops, leaving the legumes to depend on residues left over from previous applications to maize or other crops.

In the case of cowpeas a restrictive factor in production has, until recently, been the difficulty of harvesting and the high cost of labour involved owing to the procumbent growth-habit of the plants. With the advent of the new upright strains, however, this difficulty has largely fallen away. In fact, upright cowpeas and soyabeans lend themselves to easy mechanical handling and require a minimum of manual labour provided the stand of the crop is close enough. The thicker the stand, the more upright are the plants in growth and the more readily are they cut with a mower or self-binder.

It is, however, not merely a question of thickness of planting, but one of a combination of agricultural practices. The first requirement is a soil surface reasonably free from weeds and weed seeds at the time of planting. This involves the destruction of at least two crops of weed seedlings *by surface cultivation* prior to planting. The inefficacy of ploughing as a means of obtaining a clean planting surface has repeatedly been pointed out. Weed seeds will germinate only in the upper 3 or 4 inches of the soil and though ploughing might destroy a standing crop of weeds, it brings a fresh supply of weed seeds to the surface.

Several methods of planting may be followed, depending upon the relative freedom of the surface soil from weeds. Should the soil be very weedy, it would be advantageous to use the ordinary maize planter and space the rows wide enough apart to permit of inter-row cultivation, but the distance between rows should preferably not exceed 30 inches. For both soyabeans and upright cowpeas the spacing in the row ought not to be greater than 3 inches. On clean soil the planter may be set at 36 inches and the rows straddled, thus giving a distance of 18 inches between rows. Alternatively, a wheat drill can be used either with all spouts open or with every alternate spout closed up. And lastly, the old method of broadcasting is not without merit, especially in the case of upright cowpeas.

At a high rate of seeding by means of the maize planter or wheat drill the harrow may be employed to continue weed destruction in the early stages of growth, but then only during the first two or three days after planting and not again until the plants have formed their second set of true leaves or are about 4 inches high. After this the crop is usually able to look after itself and may even succeed in smothering almost completely any later germination of weeds.

Cutting should be done as soon as the first pods are well laden. Operations of raking and cocking the hay are best carried out during early morning before the material becomes dry and brittle, as otherwise considerable loss of leaf might occur. The use of the self-binder gives excellent results in preventing loss of leaf and facilitating the handling of the crop, but owing to the shortage of binder twine it cannot at present be recommended.

Other Legumes.

In bushveld or lowveld areas the velvet bean gives higher returns than either cowpeas or soyabeans, but it is not readily handled by machinery in the process of haymaking. Another crop which deserves greater attention, especially in warmer parts of the country, is sunnhemp. The crop is completely upright in growth and has the great advantage of being very highly resistant to eelworm. It should

be thickly sown and cut during the flowering stage to prevent the hay from becoming too coarse and fibrous.

Peanut hay is a valuable feed, but hay production is secondary to that of seed, and the best that farmers can do is to prevent wastage.

Vetches have become popular in the winter rainfall area proper and in certain sections of East Griqualand and the far eastern Transvaal highveld, but seed supplies are limited and the greatest economy in their use is an absolute necessity.

Ticks and Tick-borne Diseases.—

[*Continued from page 556.*

transmission of tick bite fever in man. In many parts, however, the bont legged tick is responsible for a considerable amount of damage due to the mechanical injury inflicted by it, which is frequently the site of secondary invasion by bacteria. In this way invasion of the sensitive tissues of the hooves by the necrosis bacillus, giving rise to the condition known as foot rot, frequently follows initial tick injuries to the coronet, particularly in sheep in the north-western Cape. Painful swellings followed by severe lameness are often associated with tick bites behind the shoulder and such infections of tick bites frequently lead to the sloughing of teats from udders or the tips of tails, depending upon the site of attachment of this species. On account of the long mouth parts and the severe inflammatory zone surrounding the bite, such tick bites are very prone to attack by the cattle maggot fly, *Chrysomyia bezziana*, in the Northern Transvaal, and vigorous efforts at the control of this and other species of ticks are being demanded of the farming community.

Rearing and Feeding of Chicks.

[*Continued from page 570.*

it is exceedingly difficult to determine the breeding capacity of parent birds when chick mortality is high.

It may be of importance to point out here the factors which should be taken into account in determining the quality of day-old chicks:—

(1) *Vigour and health.*—The chicks should be healthy and normally developed, without any signs of deformity; the yolk should be properly absorbed and the navel healthy; the vent should be clean and there should be no accumulated excreta present on the surrounding fluff; the down over the entire body should be quite dry and free from stickiness.

(2) *Size.*—Twenty-five day-old chicks of good quality should weigh approximately 2 lb.

(3) *Breed characteristics.*—The chicks should be free from breed disqualifications.

(4) Information in regard to the vigour and health of the parent birds will greatly aid the producer in forming an opinion of the quality of the chick.

Bovine Mastitis.

S. W. J. van Rensburg, Veterinary Research Officer, Onderstepoort.

MASTITIS is an inflammation of the udder. Several forms of this disease occur in cows, but only the more prevalent chronic type will be considered here.

Of the three diseases (tuberculosis, contagious abortion, and mastitis) that are an ever-present menace in every country in which dairy farming is practised, mastitis is without doubt by far the most important from the economic and the public health points of view. Yet its full significance is by no means fully recognised, and in many instances it is completely ignored until it is firmly established in a herd. This is probably due to the fact that the losses caused by mastitis are not so apparent as those resulting from the other two conditions. It is an insidious disease and its introduction into a clean herd is generally not noticed; once established it spreads unobserved and by the time it is recognised by the farmer over 50 per cent. of the animals may be affected.

Mastitis rarely causes direct loss through death, but may be responsible for enormous indirect losses. These are brought about by: Loss of milk, reductions in lactation life of cows (herd wastage), physical and chemical changes in the milk, and unsuitability of mastitis milk for human consumption.

Los of Milk.

It is impossible to state definitely what the percentage reduction in milk yield is in affected cows, since this naturally depends on the degree of infection and the extent of induration or hardening in the affected quarters. It has, however, been estimated that in cows showing moderate mastitis the milk yield is reduced by about 20 per cent. and butterfat by about 25 per cent.

In 1929 the number of milk cattle in the United States of America was about 21,820,000, and it is considered that the direct loss of milk from these on account of mastitis amounted to £10,000,000, while the decrease in the value of each infected cow brought the loss of the year up to £15,000,000. The annual loss from mastitis in Germany with just over 9,000,000 cows is assessed at £14,500,000. Investigations carried out show that the position in South Africa during the previous three years as regards the prevalence of mastitis is as bad or even worse, and that our losses are proportionately higher than in the two countries quoted.

The examination of cows in thirteen typical South African dairy herds selected at random yielded the following results:—

Number of cows tested	498
Number positive for mastitis	348 (69·9%)
Number negative	117 (23·5%)
Number suspicious	33 (6·6%)

The examination of milk from 1,128 individual quarters showed that of this number 29 (2·5%) were functionless, 791 (70·1%) yielded milk of abnormal composition, and only 308 (27·3%) quarters secreted milk of normal composition. The percentage infection in these individual herds varied from 27·3 per cent. to 100 per cent.

Herd Wastage.

A very important factor in considering the economic side of mastitis is the reduction in the lactation life of infected cows. A normal healthy cow is capable of producing 7 or 8 calves and yielding her full quota of milk for a similar number of lactation periods. In mastitis herds, young heifers are frequently found to be infected soon after the first calving. The udders of such animals never have an opportunity of attaining their full development, and by the time they reach their third or fourth lactation—when normal cows attain the height of their milk production—such infected animals have to be prematurely retired and disposed of to a butcher owing to the permanent damage done to the udder by this disease. In their brief period of service they thus produce only half the number of calves and less than half the quantity of milk which the owner is entitled to expect from them.

In New York State alone, in which there are about 1,330,000 cows—approximately equal to the number in South Africa—about 57,000 cows are discarded every year merely because of udder troubles. With the high incidence of mastitis in South Africa the wastage is probably even higher than in New York State.

Changes Produced in Milk.

To appreciate the full significance of the alterations produced by mastitis in the composition of milk, one must be acquainted with the composition of normal milk. This is:—

	Per cent.
1. Water	87·31
2. Fat	3·67
3. Solids—not fats:	
(*a*) Sugar (lactose)	4·78
(*b*) Proteins:	
(i) Casein	2·68
(ii) Albumin	0·56
(iii) Globulin	0·18
(*c*) Ash	0·75

The ash consists of the salts of potasium, phosphorous, calcium, chlorine, sodium, sulphur, magnesium and iron. In addition to these, milk contains various vitamins.

The nutritive value of milk is furnished by the solids. Fat supplies 50 per cent. of the energy value of milk, and lactose 30 per cent. The most important function of lactose, however, is that it promotes the absorption and metabolism of calcium and phosphorous and has a definite calcifying effect on bone. Casein is a muscle-builder, assists in the maintenance and growth of the body, and is essential in cheese-making. Milk is the best source of calcium, and on account of the action of lactose greater amounts of calcium and phosphorus are utilised when taken in milk than when taken in equal quantities of other foods.

Our knowledge of the manner in which milk is formed is rather incomplete. Some of the constituents like the salts and some proteins (albumin and globulin) also occur in the blood, and it can be assumed that these pass direct from the blood into the milk. Fat, casein and lactose on the other hand are not present in blood. In fact these

three constituents are characteristic of milk alone and are not found in any other biological fluid. They are formed in the udder and are secreted by the epithelial cells lining the small alveoli of the udder. It follows therefore that any inflammatory process which causes a wholesale shedding of the cells and extensive pathological changes in the udder tissue will accordingly produce a marked alteration in the composition of the milk. The result of inflammatory reactions is thus a decrease in those constituents of milk which are elaborated by the epithelial cells and an increase in those derived from the blood. Briefly, mastitis produces a decrease in fat, lactose, casein, calcium, phosphorous and potassium, and an increase in albumin, globulin, chloride, sodium, sulphur, catalase, body-cells and pathogenic bacteria.

The inevitable result is that in a herd with a high incidence of mastitis, the fat and the solids-not-fat contents of the bulk milk are seriously reduced—so much so in some cases that the producer is rendered liable to prosecution for selling milk which does not conform to the required standard.

Great concern has been expressed over the deficiency of solids-not-fat, and it has even been suggested that the standard of 8·5 per cent. for S.N.F. is too high and should be reduced or abolished. As a cause of this decrease all possible factors have been suggested such as climatic conditions, feeding, breed, individuality, milking methods, etc. None of these, however, offer a satisfactory explanation, since it has been shown that the effect on the milk solids of variations in all the factors mentioned is, if anything, but slight. In view of the widespread prevalence of mastitis in this country and the marked effect which it has on the composition of milk, one can come to no other conclusion but that this disease is mainly responsible for the deficiency of solids-not-fat. Any lowering of the standard from 8·5 per cent. in order to accommodate the effects of the increasing prevalence of mastitis would be tantamount to an admission of defeat.

The following averages of the total solids in the milk supplied to one of our largest towns during the five years, 1933 to 1937, are interesting:—

Year.	*Total Solids. Per cent.*
1933	12·228
1934	12·2
1935	12·2
1936	12·088
1937	12·05

These figures are significant in that they show a gradual decrease in the total solids from 12·228 per cent. in 1933 to 12·05 per cent. in 1937.

This represents a drop of ·178 in 5 years, which is equivalent to 1·45 per cent. No attempt is made to assign a reason for this decrease, but it is very probable that it bears a close relation to the increase in the incidence of mastitis.

Unsuitability of Mastitis Milk for Consumption.

Mastitis is not always produced by one kind of organism but by several different varieties, the chief ones being certain streptococci, staphylococci and the tubercle bacillus. While the tubercle bacillus

is definitely infective for man, the streptococci and staphylococci which cause mastitis are only sometimes so, and it is therefore not possible to state accurately to what extent mastitis milk is responsible for disease in human beings. Fortunately the commonest cause of mastitis, namely *Streptococcus agalactiae*, does not appear to infect man. On the other hand, *Streptococcus pyogenes*, the cause of scarlet fever, tonsilitis and septic sore throat, can under suitable conditions infect the udder of a cow, setting up mastitis which may be either mild or very acute. Milk from such an infected udder contains large numbers of these streptococci and may produce an extensive outbreak of scarlet fever and septic sore throat amongst the consumers. Serious outbreaks of gastro-intestinal disturbance have been traced to staphylococci found in milk, and it is quite possible that some of the staphylococci which are capable of producing mastitis are also those which can cause gastro-intestinal disturbance in man. Formerly cows were not regarded as the source of infection in such outbreaks, and the view was held that the infection was derived from a milker or person engaged in handling milk and that the milk merely acted as a vehicle for the responsible organisms. It has, however, now been established that a human carrier may actually infect a cow with such bacteria while milking, that mastitis may thus be set up, and that such a cow may continue discharging the bacteria in the milk and producing the disease in human beings for a long time. This fact accounts for many of the mysterious outbreaks of epidemics of milk-borne diseases.

Apart from the possibility of conveying disease, the consumption of mastitis milk is to be condemned on account of the extensive changes produced in the milk. As already stated, all those constituents which are responsible for the high nutritive value of milk are reduced and replaced by substances like salt, pus, etc., which, although perhaps not harmful, are lacking in nutritive value, are objectionable, and would not be tolerated in any other article of food but milk, in which their presence is effectively masked by the white colour.

The conscientious producer frequently makes an honest attempt to remove the undesirable portion by straining the milk. This recalls a number of pictures which were published by one of our prominent newspapers under the caption "Keeping your milk Pure", showing milk being bottled and clarified in a certain dairy. The irony of this is contained in an explanatory sentence which reads: "Sometimes as much as 3 lb. of sediment is extracted and this after the milk has been filtered three times". This sediment (3 lb.), plus that removed by the three previous filtrations, consists mainly of pus and bacteria derived from mastitis udders and would never have been present in the milk had this been produced by cows with healthy udders.

The deficiency of casein seriously affects the suitability of milk for cheese-making. It retards and may even completely prevent the formation of curd when rennet is added. The curd is usually soft and correspondingly more difficult to handle, and the texture of the cheese is abnormal. There is a tendency for it to be sandy, to retain moisture abnormally, and to become mouldy and discoloured.

It is evident from the above that pasteurization or boiling is ineffective in dealing with mastitis milk. It may kill the organisms but it cannot remove the objectionable substances which are inevitably present in such milk, still less can it restore the essential constituents which are either deficient or completely absent.

As in the case of pasteurization, a low bacterial count is sometimes quoted and has a wonderful effect in lulling an ignorant consuming public into a false sence of security. The bacterial count gives no indication of the presence or absence of pathogenic bacteria in milk. It merely registers the number of bacterial units which are capable of multiplying under the particular conditions selected. These are usually only saprophytic bacteria which get into the milk after it has been drawn, and at most such counts do no more than indicate the degree of cleanliness observed in milking and in handling the milk. They do not reveal tubercle bacilli, contagious abortion and mastitis organisms even though these may be present in large numbers. In fact some workers believe that mastitis streptococci have an inhibtory effect on saprophytic bacteria so that a low bacterial count may actually be indicative of the presence of a large number of mastitis organisms in the sample.

It is only by the examination of individual animals and of their milk that all the diseased conditions of the udder can be detected. While South Africa is very far advanced in so far as the control of milk after it has left the cow is concerned, the most important factor in the production of clean, safe and wholesome milk, namely, the source of the milk (the udder) has up to the present been completely neglected. We find, for instance, that in the whole of the Union, veterinary examination of milk cows is carried out only in four towns, and even in these it is not as thorough as it ought to be, owing to inadequacy of staff. What can be achieved if there is proper supervision of the cows is illustrated by the experience of Lansing in America. In April 1935 the Lansing Board of Health passed a ruling to the effect that all milk sold must be produced by cows free from streptococcic mastitis. The first test, carried out the same month, revealed that 47·8 per cent. of the cows in twenty dairies were infected. In October, six months later, this percentage had been reduced to 8·5, and infection was then confined to three dairies.

Methods of Spread.

Whatever bacteria may be the cause of mastitis, the methods of infection and of spread are essentially the same, and these in conjunction with the predisposing factors are of utmost importance in controlling the disease.

It has been definitely established that in the great majority of cases the casual organisms get into the udder by way of the teat duct. Second in importance as a channel of infection are wounds and injuries of the udder and teats through which bacteria may gain entrance. Repeated attempts to produce infection by giving the organisms through the mouth have failed, and therefore the chances of a cow becoming infected by eating contaminated food or drinking contaminated water are very small. Mastitis does, however, sometimes occur as a secondary condition to suppurative diseases in other parts of the body, such as metritis or retention of the afterbirth.

The spread from one cow to another is mainly by means of the milker's hands. In the absence of proper segregation between infected and non-infected cows, a milker may get his hands contaminated with streptococci when milking an infected cow, and if his hands are not washed before the next cow is milked, the organisms may be rubbed on the teats of that cow and subsequently find their way into its udder.

Dirty and contaminated floors are also a very fertile source of infection. The danger of cows contracting the infection is greatly increased where they have to sleep in stables. Floors may become contaminated in many ways but principally through the objectionable habit many milkers have of milking out the first few streams onto the floor, and through the tendency shown by some teats to leak when distended.

Of considerable importance too, from the control point of view, is the fact that there is ample evidence to show that mastitis is not usually produced immediately the causal organisms get into the udder. In fact, research workers frequently experience great difficulty in setting up the disease experimentally by the injection of large doses of the bacteria into the udder. Once in the udder the organisms may live and multiply for a long time without producing symptoms of inflammation. Such cases, in which there is infection but no clinical symptom, are known as latent or subclinical mastitis. Cows with this form of the disease must nevertheless also be regarded as a potential source of danger to healthy animals, since they are capable of secreting large numbers of bacteria in their milk.

Latent mastitis develops into the active or clinical form whenever factors arise which break down the natural powers of resistance of the udder with the result that an inflammatory reaction takes place. Such factors are known as predisposing causes and the following are the most common:—

(*a*) Wounds, injuries and abrasions of the teats, such as may result from poking, kicking, treading on the teats, tick bites, etc.

(*b*) Bad milking, for instance not milking out the udder completely, irregular milking, allowing the udder to become overdistended, and undue pulling of the teats during milking.

(*c*) The careless and indiscriminate use of milking tubes.

(*d*) Dirty and unhygienic conditions, absence of grooming, failure to wash udders, and to remove dirt, mud and manure from them.

(*e*) The presence of other diseases which may lower the vitality of the cow, e.g. contagious abortion.

(*f*) A factor which is more and more being regarded with increasing suspicion as being of paramount importance in promoting the development of clinical mastitis is the stabling of cows overnight, the cows being forced to sleep on cold cement floors. This not only favours the introduction of streptococci into the udder through the teats that are in close contact with floors and bedding throughout the night, but it is also bound to play a very great role in predisposing to active inflammation by destroying the natural powers of resistance of the udder. In this connection we must remember that the udder is a highly developed glandular organ which is very sensitive and in a continuous high state of activity throughout lactation. Having such a delicate organ in close contact with a cold damp cement floor is certain to provide one of the best means of breaking down all the defensive powers which the udder may possess against disease. We dread sitting on a cold stone for even a few minutes because of the unfavourable consequences which may follow such a rash act. Yet the sitting extremity of a human being is a far hardier anatomical structure that the udder of a cow! Ample bedding is of no avail since this is usually pushed out from under the cow soon after the cow lies down, and it probably only serves to increase the dampness. In our methods of stable construction and the acquired habit of making

cows sleep indoors, we have apparently lost sight of the fact that Providence has blessed us with the world's most wonderful climate and we have followed European customs too closely regardless of the tremendous difference in climatic conditions.

It is a common belief that cows have to be stabled, especially in winter, in order to ensure a good milk supply. Experiments at the Potchefstroom College of Agriculture have, however, shown that stabling is not necessary during winter months, provided the cows sleep in a sheltered paddock and are well fed (see *Farming in South Africa* of August, 1941, or Reprint 66/1941).

Then also there is the experience of dairy farmers in some of the coldest parts of the Union, such as the Transvaal highveld, who after stabling their cows for years, decided to allow them to sleep out throughout the year. These farmers are now unanimous in their opinion that whatever reduction (if any) there may be in milk yield, is more than compensated for by the improvement in the health of the cows and their greater freedom from diseases like mastitis and tuberculosis.

Diagnosis.

One of the greatest difficulties confronting the farmer, as well as the practising veterinarian, in the control of mastitis is the absence of a method of diagnosis which is both simple and absolutely reliable. There is no other disease for which so many diagnostic tests are available as for mastitis. Yet every test has its limitations. Briefly these tests are based on:—

(*a*) Identification of the causal organisms.
(*b*) The microscopic appearance of the milk.
(*c*) The pathological changes in the udder.
(*d*) The physical and chemical changes in the milk.

(*a*) For the proper identification of the responsible bacteria, a somewhat elaborate bacteriological examination of milk samples is necessary. This is therefore essentially a laboratory method and one that cannot even be carried out by a practising veterinarian unless he is equipped with the facilities necessary for bacteriological examination. For such examination the milk must be taken under sterile conditions and must be delivered at the laboratory within a few hours of being drawn. It is thus obviously not a method which can be widely utilized under South African conditions. Investigations are at present being made which aim at overcoming the danger of contamination by adding preservatives to the milk samples, but the results so far have not been encouraging.

(*b*) The microscopic examination of milk is a simpler method but it too can be undertaken only by a trained official. As stated above, mastitis milk shows an increase in the number of body-cells, and this gives a fairly reliable indication as to the absence or presence of infection. Microscopic examination is also carried out on smears from incubated samples of milk in order to detect the mastitis streptococci, and this is a very accurate method of diagnosis.

(*c*) In clinical mastitis the pathological changes produced in the udder tissue can be felt by manual examination of that gland. This is a practical method which farmers can and should employ more, especially when buying cows. Yet it is very seldom used. It is probably no exaggeration to state that 90 per cent. of farmers, when buying cows specially for milk production, never think of examining the udder or getting a veterinarian to do that for them. This unpar-

donable negligence is frequently responsible for the introduction of mastitis into clean herds. Scores of times farmers who consult us on mastitis come forward with the same sad story " My herd was quite alright until I bought a few cows at such and such a sale about a year ago ".

There are two essentials for the successful examination of the udder, especially when the alteration are not far advanced. In the first place, the examiner should have a thorough knowledge of the consistency and appearance of the normal udder. Secondly, one should never attempt palpation of a distended udder but should insist on it being milked out completely just before examining it. Nobody however experienced, can detect slight changes in a fully distended udder. Different udders vary in consistency, and therefore, it is advisable to compare the four quarters of the same cow with one another. Further one should view the udder both from behind and from the side. Any loss of symmetry should be regarded with suspicion.

(*d*) Very large numbers of tests are based on the changes in the composition of mastitis milk. Many of these, e.g., chloride, lactose, rennet, and casein tests must be regarded as laboratory tests and need not, therefore, be discussed here. As stable tests which can easily be carried out by the farmer we can recommend the " strip cup " (or " black cloth ") and alkalinity tests.

The strip cup consists of a container over which a 100 to 120-mesh wire screen has been placed. Three or four streams of the foremilk are milked through the screen. Instead of a wire screen a black cloth may be used. The appearance of flakes or small clotted masses upon the screen or cloth is a definite indication of mastitis.

The alkalinity tests are based upon the fact that normal milk is neutral in reaction. Mastitis usually increases the alkalinity on account of the increase in chlorides, and this may be so marked that the milk has a salty taste. Certain drugs known as indicators are used to show the degree of alkalinity. These should only be used on the milk from individual quarters. The most common indicators used for milk are brom-cresol-purple and brom-thymol-blue. In our experience, however, the " universal indicator " prepared by the British Drug Houses has given better results than any of these two. One drop of this indicator added to 3 or 4 drops of milk imparts a yellow colour to normal milk, and in the case of mastitis milk produces a greenish yellow colour passing to green or even blue in bad cases.

When a positive reaction is given with any one of these tests, it can be regarded as a case of mastitis, but on the other hand a negative result does not justify the conclusion that the cow is free from infection, since none of these tests, excepting bacteriological and microscopic examinations, will reveal the disease in its earliest stages. Nevertheless the regular application (say once a month) of one or other of the alkalinity or strip cup tests will be of considerable assistance to the farmer in detecting cases early and preventing the spread of the disease by segregating infected cows.

Treatment.

Unfortunately with mastitis, as with most other diseases, there is a tendency among farmers and dairymen not to worry unduly about preventive measures but to allow the disease to get a firm hold on the herd and then to resort to various kinds of treatments to try and cure the condition. In probably no other disease is this disregard for the rules of prevention attended with more disastrous results than in mastitis.

Several factors militate against the 100 per cent. cure for well established cases of chronic mastitis, viz.:—

(*a*) The difficulty of making an early diagnosis.

(*b*) The fact that the causal organisms do not circulate in the blood stream but like, tubercle bacilli, are essentially tissue parasites, being confined to the udder and the lesions which they produce in the udder. Drugs like sulphanilamides which are bactericidal to streptococci in the blood do not appear to have very much effect on the same organisms when such organisms are confined to the udder.

(*c*) The fact that the condition may be produced by several different types of organisms. This, in conjunction with the fact that it is not a toxaemia, renders effective control by vaccination more difficult.

(*d*) The structure of the udder. The glandular portion of the udder consists of a large number of very small cavities (alveoli) lined by epithelial cells which secrete the milk. From the alveoli the milk is conveyed by small milk tubules to the large cistern or sinus, and from here to the exterior by the teat duct. These tubes and tubules are also lined by epithelium. There are about 400 alveoli in every cubic millimetre of glandular tissue and about 700 epithelial cells in every alveolus. This means approximately 1·6 billion epithelial cells in the whole udder. It can therefore be appreciated that it is practically impossible to reach every cell or even every alveolus with drugs injected through the teat ducts.

There is probably no other disease for which so many drugs and alleged cures have been tried as for mastitis. Scarcely a week passes without news of a new and "certain cure", and almost every agricultural and veterinary journal published inspires the hope that a satisfactory method of treatment has at last been found, but up to the present all these "certain cures" have failed when put to the crucial test.

The ways in which drugs are administered in attempts to cure the disease are (*a*) through the mouth, (*b*) injection through the teat ducts, (*c*) by external application and (*d*) by vaccination.

(*a*) *Oral Administration.*—Success has been claimed for many drugs given as drenches, e.g., turpentine, formalin, linseed oil, sulphanilamide and many proprietary remedies. Admittedly, such treatment does sometimes bring about an improvement or even an apparent cure. This occurs more in those cases which cannot strictly be regarded as mastitis but are more of the nature of a physiological congestion of the udder such as frequently occurs after calving, and also in latent cases which suddenly flare up as acute mastitis. Repeated doses of raw linseed oil, for instance, definitely appear to be beneficial for such conditions, probably more on account of the laxative effect of the oil than anything else. Hower, where properly controlled experiments have been carried out with such drugs no case has been recorded in which the oral administration of a drug has succeeded in sterilizing the udder.

Recently, great hopes were entertained that the sulphanilamides which act specifically on streptococci in the blood would at last provide the long-awaited certain cure for mastitis. Drugs belonging to this class have accordingly been tried out extensively both in Europe and in America, but while they have given encouraging results in the more acute types of disease, their action in the more prevalent chronic forms has been disappointing. This can be appreciated when one considers that mastitis is not a septicaemic condition and that the

sulphanilamides cannot be given in sufficiently large doses to kill streptococci in the udder without endangering the life of the cow.

It should be pointed out too that the administration of drugs through the mouth is generally accompanied by instructions for local and general treatment such as stripping the udder every hour or two, fomenting and massaging it at the same time, cutting down concentrates and giving a laxative diet. This treatment is often of greater value than the drugs themselves.

(*b*) *Udder Infusions.*—This method of treatment is rapidly gaining favour, and the efficacy of different drugs injected through the teat duct has already been tested, e.g., boracic acid, chinosol, iodine, silver nitrate, formalin, various gases, and the acridine derivatives like acriflavine and trypaflavine. The active ingredients of many of the proprietary drugs issued for mastitis are one or other of these flavines. The reports of research workers in various parts of the world show that greater success has attended the infusion of solutions of such drugs, especially of the flavines, into the udder under proper supervision and in selected cases, than any other method of treatment.

It is necessary here to emphasize "proper supervision" and "selected cases" because the introduction of drugs into the udder is accompanied by many dangers. Unless scrupulous antiseptic precautions are taken, the disease may be aggravated instead of cured. The solutions must be made up in the proper concentrations, injected at the proper temperature, and the udder must not be overdistended. This treatment is usually resorted to only after the condition is well advanced and when there is chronic fibrosis (hardening) of the udder. It is obviously impossible for any drug to break down the new tissue which has formed in the udder, and in such cases infusion may do more harm than good. All the experimental work has shown that any success which may attend this form of treatment is achieved only if the treatment is applied in the early stages of the disease or in cases of latent infection. Hence the necessity for careful selection of cases for treatment.

It is evident too that the treatment of one or two animals in an infected herd will not be of much avail unless such animals can be segregated from the infected in order to obviate the possibility of re-infection. Therefore, where treatment is carried out it is advisable to follow a well-defined plan and to combine treatment with proper segregation between infected and healthy cows.

(*c*) *Ointments.*—Ointments and liniments applied externally to the udder and teats cannot be regarded as certain cures in that they cannot be depended on to kill infection in the udder, although they may have a certain value as preventives. The beneficial effect of ointments is to a large extent dependent on the rubbing and massaging of the udder which their application involves.

(*d*) *Vaccines.*—No other type of treatment has given rise to so many conflicting views and opinions as the use of vaccines both as a cure and as a prevention against mastitis. Various types of vaccines have been tried out by innumerable investigators in many countries. A few claim some degree of success but the majority is not enthusiastic. Most of these workers did not control their experiments properly, so that scientifically not too much importance can be attached to their findings. It appears that only one research worker, namely Seeleman, one of the world's greatest authorities on mastitis, carried out vaccination experiments in the proper scientific manner

with adequate controls. He investigated various aspects of vaccination and came to the conclusion that vaccines were useless both as curatives and as preventives.

Control.

Sufficient has been said to indicate that there is no real satisfactory method of curing chronic mastitis, and that more so than in any other disease is proper control and prevention of the utmost importance in the case of mastitis, on account of the serious economic effects of this disease.

Prevention and control in this case can be undertaken without involving farmers in severe financial loss or heavy additional expenditure. No comprehensive method of control has as yet been practised in South Africa, but according to results obtained by well-known workers in other parts of the world (such as Stapleforth in England, Plastridge and Udall in America and Roemmle in Germany) the disease can be brought under control and even eradicated by the simple method of testing regularly, segregating infected cows and practising proper stable hygiene. The following measures are recommended:

1. Test all milking cows regularly for mastitis. Where possible get veterinary or laboratory assistance in doing this. Otherwise use one or more of the stable tests recommended above.

2. Segregrate all cows showing any trace of infection. If possible put them in a seperate stable. Otherwise keep them on one side in the stable or at the end of the milking line.

3. Use seperate milkers for healthy cows, or have such animals milked first.

4. Do not let cows sleep in the stables but preferably in a paddock situated in a sunny position, yet amply protected by windbreaks for example against cold.

5. Sell to the butcher all cows showing definite clinical mastitis with hardening of the udder and a purulent or watery appearance of the milk.

6. When making replacements, take the necessary steps to ensure that the animals are free from mastitis. If it is not possible to have them tested before purchase, then isolate them until they have been tested.

7. When starting dairy-farming, commence with a clean herd. Preferably build up a clean herd from heifers instead of buying old discarded cows from any available source.

8. Have a proper supply of water laid on for the stable or milking shed so that the floors can be flushed regularly.

9. Provide proper drainage not only in, but also outside, the stable so that cows do not have to wade through a lot of mud, and slush and manure when coming into the stable.

10. Have cows groomed regularly and kept reasonably clean.

11. Wash and thoroughly dry udders before milking.

12. Use separate towels for healthy and for infected animals and wash the towels frequently in a disinfectant solution such as chlorine, 1 part in 5,000 parts of water.

13. Milkers should wash their hands not only before milking is commenced but also after each cow is milked.

14. The first few streams of milk should not be milked on to the floor but into a separate bucket and should be destroyed.

15. After milking, the teats of every cow should be dipped into a mild antiseptic solution like the one mentioned in 12.

16. Do not permit wet milking.

17. Every cow should be milked out completely.

18. Heavy producers should be milked more often than twice daily.

19. Do not dry off cows too rapidly at the end of the lactation period.

20. Do not feed concentrates too heavily the last week before calving or the first week after calving.

21. Newly calved cows should be tested for mastitis from 7 to 10 days after calving.

22. Employ capable and reliable milkers who can be relied on to milk out thoroughly and not to injure the udder and the teats by exerting an unnecessary pull on them.

23. Treat promptly all wounds, bruises, etc., of the udder and teats.

24. Keep cows, and particularly their udders, free from ticks.

25. Do not use milking tubes unless absolutely necessary, and in that case ensure that they are properly sterilized and used with due care.

26. Get prompt treatment for such conditions as retention of the afterbirth, which may predispose to mastitis.

27. Keep the herd free from contagious abortion.

28. Have proper supervision, preferably European, in the stables. No matter how capable and reliable a Native may be he simply cannot apprecite the full significance of good hygiene, and to his mind irksome little details like washing of hands and dipping the teats in antiseptic after milking are merely unecessary fads.

At first sight the above appears to be a very formidable list of "do's" and "don'ts", but apart from the first three dealing more specifically with mastitis, the balance can be summarized in the three words "proper stable hygiene". Most of the measures recommended are such as ought to be carried out by every conscientious and progressive dairy farmer quite independent of the question of mastitis. The additional steps, like testing and segregating, which are suggested more particulary for dealing with mastitis may involve a little extra work and worry, but are not impracticable and if carried out assiduously they will ultimately prove to be the most important factors in converting an unprofitable dairy concern into a paying proposition.

Information on Departmental Publications.

Farming in South Africa, the monthly journal of the Department, contains popular as well as scientific articles on a variety of agricultural topics, useful to both the farmer and the housewife, while the **Crops and Markets** Section, supplies information on crop prospects, market prices and exports of agricultural produce.

The following particulars in regard to subscriptions and advertisements should be noted:—

Subscription.—Within the Union, South West Africa, Bechuanaland Protectorate, Southern Rhodesia, Swaziland, Basutoland, Mocambique, Angola, Belgian Congo, and British Territories in Africa 5s. (otherwise 7s. 6d.) per annum, post free, payable in advance.

Applications, with subscriptions, to be sent to the Government Printer, Koch Street, Pretoria.

Advertisements.—*The Tariff for Classified Advertisements is:* 2d. (two pence) a word with a minimum of 5s. per advertisement (prepaid). Repeats, not entailing any change in the wording, will be published at half the cost of the original.

Conditions:—

(1) The advertisement will be classified under specific headings, and only one black letter (initial letter) is permitted.

(2) Advertisements in which prices are mentioned must contain the name and address of the advertiser. A nom-de-plume or box number only is not sufficient, and unless this condition is strictly observed advertisements will not be accepted.

(3) Advertisements will be classified strictly in accordance with the subject-matter of the announcement, determined by the first item mentioned, and cannot be inserted under irrelevant headings.

(4) Displayed, classified advertisements will also be accepted. The charge however, will be 15s. per inch, single column, per insertion, without reduction for repeats.

Copy for Advertisements to be in the hands of the Government Printer, Pretoria, not later than the 20th of the month preceding publication.

Send all advertisements direct to the Government Printer, or write to him for details as to tariff for advertisements.

Popular Bulletins.—Bulletins on various agricultural topics are published by the Department to meet public demand. A list of available bulletins giving particulars of cost, etc., is obtainable free of charge from the Editor, Department of Agriculture and Forestry, Pretoria.

Scientific Publications.—From time to time the different Divisions of the Department issue science bulletins incorporating the results of research work conducted by them. Other scientific publications issued are: "The Onderstepoort Journal", "Memoirs of the Botanical Survey of South Africa", "Bothalia", "Entomological Memoirs" and the "Annual Reports of the Low Temperature Research Institute". Information in regard to these publications is obtainable from the Editor, Department of Agriculture and Forestry, Pretoria.

Press Service.—The Press of South Africa is now supplied with a bulletin of agricultural information for their exclusive use. This information is published fortnightly by all newspapers and other journals throughout the country.

Farmer's Radio Service.—In addition to the printed information supplied by the Department to members of the farming community, the Department, in collaboration with the South African Broadcasting Corporation, also maintains a daily broadcasting service to farmers. Information in regard to times of broadcasting is contained in the programmes issued by the Broadcasting Corporation.

Inquiries.—All general inquiries in regard to the publications of the Department, including the Radio Service, should be addressed to the Editor, Department of Agriculture and Forestry, Pretoria.

D. J. SEYMORE, Editor

Crops and Markets

A Statistical and Economic Review of South African Agriculture

by

The Division of Economics and Markets

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CONTENTS

* Price Review for July, 1942.

SLAUGHTER CATTLE.—A moderate supply of mostly compounds and mediums in conjunction with an exceptionally sharp demand caused prices to be generally higher than in June. Thus ordinary primes on the Johannesburg market rose from 53s. 8d. per 100 lb. estimated dressed weight on the hoof in June to 57s. 8d. in July, good mediums from 49s. 8d. to 53s. 6d., and compounds from 39s. 5d. to 44s. 3d.; while on the Durban market mediums rose from 37s. 1d. per 100 lb. dressed weight on the hook to 46s. 10d., and compounds from 28s. 6d. to 33s. 10d.

Slaughter Sheep.—Prices on all markets gradually advanced during July, so that average prices were substantially higher than during the previous month, thus prime merinos on the Johannesburg market advanced from 9·7d. per lb. estimated dressed weight on the hoof to 10·3d. per lb. in July, and prime crossbreds from 8·6d. to 9·4d. per lb.

Slaughter Pigs.—Although reasonably large supplies consisting mostly of porkers and baconers arrived on the markets, the exceptionally strong demand also caused prices in this case to increase further, e.g., on the Johannesburg market prime prokers were 6·4d. per lb. liveweight as against 5·5d. in June, while prime baconers were 8·4d. as against 8·0d. in June.

Feed.—Prices of lucerne hay and teff hay declined as a result of the new price control measure. (See August, 1942 issue of "Crops and Markets" for further particulars in this connection.) Supplies, however, diminished further compared with the previous month. The average price in July for Cape lucerne was 7s. 3d. per 100 lb. and for teff hay 6s. 1d. per 100 lb. on the Johannesburg market.

* All prices are averages.

Potatoes.—In spite of the large offerings of potatoes, generally of poor quality, prices as a result of the strong demand, declined very little during July, and in some cases were even higher than the average of the previous month. Transvaal No. 1 on the Johannesburg market decreased from 17s. 10d. per bag to 17s. in July, National Mark Grade 1, No. 2 from 22s. 3d. to 21s., Natal No. 1 on the Durban market from 20s. 4d. to 19s. 6d., while Cape No. 1 on the Cape Town market increased from 17s. 10d. to 19s. 6d. per bag.

Onions.—Onions, especially Cape onions, were well supplied. Prices changed very little. Cape onions on the Johannesburg market were 14s. 10d. per bag and on the Capetown market 12s. 10d. per bag.

Vegetables:—Consignments of green beans and green peas from the Transvaal Lowveld were present on all markets, while cabbage, cauliflower and pumpkins were also still abundant. The prices were generally maintained on a high level.

Tomatoes.—Heavy consignments of tomatoes from the Transvaal Lowveld, in many cases of poor quality, caused prices everywhere to decline. On the Johannesburg market, National Mark tomatoes in trays decreased from 2s. 8d. in June to 2s. 3d. in July. On the Capetown market ordinary tomatoes decreased from 2s. 5d. to 1s. 11d., and on the Durban market from 1s. 4d. to 1s. 1d.

Citrus Fruit.—Citrus fruit were predominant, and large supplies of especially oranges, were present on all markets. Navels began to diminish, but supplies of oranges were maintained by consignments of Valencias and seedlings. In spite of a considerably larger supply, last month's high price level was maintained. Navels on the Johannesburg, Capetown and Durban markets were 2s. 5d., 2s. 1d. and 2s. 8d. per pocket respectively.

Eggs.—A gradual increase in supplies resulted in prices of eggs on all markets to decline considerably. New-laid on the Johannesburg market declined from 2s. 6d. per dozen in June to 1s. 8d. in July, and on the Durban market from 2s. 10d. to 2s. per dozen.

Index of Prices of Field Crops and Animal Products.

The combined index (as shown elsewhere in this issue) increased from 138 in June to 143 in July. Advances occurred in the following groups:—

(i) Pastoral products, of which wool is the most important. This group rose from 101 to 116. Wool prices in terms of the British-Union Wool Agreement have been increased by 15 per cent. commencing with the next wool clip, that is, from 1st July. This only applies to wool shorn after 1st July, 1942.

(ii) Dairy produce advanced from 154 to 167 in July as a result of the higher subsidy of 5d. per pound instead of 3d. per pound paid by the Dairy Control Board to producers on all grades of butterfat delivered by them to creameries from 1st July, 1942.

(iii) Slaughter Stock.—Further advances during July in the prices of slaughter cattle, slaughter sheep and pigs, caused the index of prices of this group to be 154 in July as against 140 the previous month.

The most important decreases occurred in the following groups:—

(i) *Hay*—which declined from 207 to 183 in July mainly as a result of the price control measure, whereby the maximum price of lucerne hay has been fixed at 6s. per 100 lb. and teff hay at 5s. per 100 lb. f.o.r. sellers' station.

(ii) *Poultry and Poultry products*—of which eggs are the most important, and which declined from 218 in June to 163 in July.

Index of Prices Paid for Farming Requisites.

It will be seen from the table elsewhere in this issue that prices of farm implements, fertilizers, bags, dip and spraying materials and building materials changed very little or nothing during the period April to July, 1942.

In the case of fertilizer, however, the index has been amended from January, 1942, to 146 as against 173 in October, 1941 in order to allow for the subsidy of £1 per ton payable on all approved fertilizers delivered to farmers on or after January 1st, 1942.

As regards the remaining groups:—

(*a*) Fuel increased from 134 in April to 146 in July as a result of increases in the price of power paraffin, crude oil, petrol, lubricating oil and grease.

(*b*) Feed increased from 127 to 154 owing largely to advances in the price of mealies and hay.

(*c*) Fencing materials advanced from 228 to 235.

Indexes of the Volume of Sales and Prices of Certain Vegetables.

(NOTE.—The data presented below, constitute in summary form, a continuation of a major study at present in progress concerning the quantities and prices of fruits and vegetables sold from 1937 to 1942 on eight municipal markets in the Union. The first part of this study appeared in the July, 1942 issue of *Farming in South Africa* and dealt with citrus fruit. Reference should be made to that article for certain observations concerning the markets and the construction of the indexes. The ultimate object of this study is to present a representative and all inclusive monthly fruit and vegetable price and volume index for the Union. A presentation of the price movements of similar products other than those already dealt with, will be summarized periodically in subsequent issues of this publication.)

The total quantity and value of eight kinds of vegetables sold by public auction from 1937 to 1941 on eight municipal markets in the Union is shown in the tabulation below. The vegetables included are: Potatoes, onions and sweet potatoes; green beans and green peas; cabbage and cauliflower; and tomatoes. The eight markets comprise the municipal markets of Pretoria, Johannesburg, Bloemfontein, Cape Town, Port Elizabeth, East London, Durban and Pietermaritzburg.

	1937.	1938.	1939.	1940.	1941.
Quantity sold, 1,000 tons......................	145·7	162·3	180·3	182·0	194·7
Value, £1,000...............................	1,093	1,059	1,020	1,507	2,194

From the above tabulation it will be observed that the volume of eight vegetables sold on eight municipal markets increased from about 146,000 tons in 1937 to about 195,000 tons in 1941 and the aggregate value during the same period, from approximately £1,100,000 to £2,200,000.

By far the bulk of the eight vegetables sold within the respective municipal areas is received by rail from relatively distant producing centres, of which at least 90 per cent. is sold by public auction on the eight markets. In addition, a substantial quantity, varying to some extent with the type of product, is produced within or adjacent to the respective municipal boundaries and sold either by auction or out of hand.

The following tabulation indicates the index of the weighted average prices of eight vegetables for each market and for the combined eight markets from 1937 to 1941. (1937 to 1939 = 100.)

	Pretoria	Johannesburg.	Bloemfontein.	Cape Town.	Port Elizabeth.	East London.	Durban.	Pietermaritzburg.	Weighted average: all markets.
1937...........	116	117	113	112	110	103	110	122	114
1938...........	99	99	99	101	101	102	102	93	100
1939...........	85	84	88	87	89	95	88	85	86
1940...........	129	126	125	124	128	117	129	122	128
1941...........	178	176	168	162	170	175	167	165	172
	Relative importance of each market, based on average volume of producer sold from 1937–1939 (per cent.).								
Per cent........	7·5	48·9	3·2	16·5	6·6	3·6	10·0	3·7	100·0

In 1941 the average prices of the eight vegetables mentioned above were, for the combined eight markets, 72 per cent. higher than the average prices for the three years preceding the outbreak of war. (The year 1939 can, be considered for all practical purposes as a pre-war year.) Prices were relatively low in 1939, but in 1941 they were twice as high.

The fluctuations in the annual prices from 1937 to 1941 were much the same in each of the eight markets. They have risen more in Pretoria, Johannesburg and East London than in the other markets and less in Cape Town, Pietermaritzburg and Durban. The differences in the price rises, however, are not very marked and it is significant to note that the prices in the various markets did not differ from the average of the combined eight markets by more than about 6 per cent.

The last line in the table shows that from 1937 to 1939, nearly 49 per cent. of the produce was sold by the Johannesburg municipal market, and 16·5 and 10 per cent. by the Cape Town and Durban municipal markets, respectively.

In the following table, an index is presented showing the prices of each of the eight vegetables in the eight markets from 1937 to 1941. An indication is also given of the rise in prices during the first seven months of 1942 as compared with the first seven months of 1941. The three years 1937 to 1939, constitute as before, the base years.

	Potatoes.	Onions.	Sweet Potatoes.	Green Beans.	Green Peas.	Cabbages.	Cauliflower.	Tomatoes.	Weighted average: all vegetables.
1937	114	118	111	118	119	137	125	106	114
1938	104	108	96	86	89	78	81	98	100
1939	82	74	93	96	92	85	94	96	86
1940	140	117	113	105	102	128	114	113	126
1941	217	110	148	133	137	173	142	133	172
	[January to July (seven months) 1937–1939 = 100].								
1941	201	107	128	149	120	146	137	126	161
1942	223	124	210	135	124	158	158	127	176
Percentage increase	+10	+16	+64	−10(*a*)	+3	+9	+15	+1	+9·3
	Relative importance of each type of vegetable, based on average volume of total sales from 1937 to 1939 (per cent.).								
Per cent.	55·6	9·9	4·8	3·9	4·0	8·2	1·6	12·0	100·0

(*a*) Decrease.

It will be observed from the above table that the price of potatoes in 1941 has risen more than any other vegetable mentioned above. The price of potatoes has risen 117 per cent. as compared with the average prices from 1937 to 1939. Cabbage also shows a substantial increase in price. The rise in the prices of the other types of vegetables, excluding onions, has been moderate. The price of onions in 1941 shows the smallest increase (10 per cent.), as compared with the average of the three pre-war years. In fact, it is the only product which declined in price from 1940 to 1941.

The lower half of the table above gives an indication of the fluctuations in prices for the first seven months of 1942. Compared with a similar period for 1941, there has been a further advance in price of about 9·3 per cent. The increases with respect to the various types of vegetables have been unequal. Sweet potatoes, though relatively unimportant, have increased 64 per cent. from the period January-July, 1941 to January-July, 1942, whereas the price of green beans has decreased 10 per cent. during the same period. It should be mentioned that, on the average, about 57 per cent. of the total produce sold on the eight markets from 1937 to 1941, were sold during the first seven months of the year.

The lower line in the table indicates that on a volume basis, potatoes constitute about 56 per cent. of the total marketings and tomatoes about 12 per cent.

The relationship between the total volume of marketings and price is shown in the following table and comprises the eight vegetables sold on the eight markets.

	Volume of Sales. (1937–1939 = 100).	Average Price.
1937	89·5	114·4
1938	99·7	99·5
1939	110·8	86·2
1940	111·8	126·2
1941	119·6	171·8

During the "normal" pre-war years there was an inverse relationship between the volume of sales and prices. During this period (1937 to 1939) it appears that a 10 per cent. decrease in supplies has resulted in a rise in prices of about 15 per cent. and a

10 per cent. increase in supplies a decrease in prices of about 15 per cent. This relationship does not hold for 1940 and 1941, since in 1941 for example, an increase in supplies of about 20 per cent. above "normal" is accompanied by an increase in price of 72 per cent. Some of the factors which have contributed to the rise in prices, in spite of larger sales, after the outbreak of war are mentioned in the article on citrus fruit published in the July, 1942, issue of *Farming in South Africa*. A further factor is that, due to war conditions, the population in the eight cities has increased since the outbreak of war more than can be accounted for by the natural increase in population alone. The European population of Pretoria (including suburbs) for example, has increased from 1936 to 1941, according to the official census, by 46·6 per cent. and that of the eight cities, during the same period, by 14·8 per cent. There has, undoubtedly, been a further migration of population to the more important urban areas during the past twelve months.

During the first seven months of 1942, the total volume of sales on the eight municipal markets were about 14·6 per cent. higher than that for the corresponding period of the previous year. During these periods the quantity of potatoes sold increased 15·5 per cent., cabbages, 28·8 per cent., tomatoes, 18·4 per cent., onions, 8·1 per cent. and sweet potatoes showed a decrease of 8·2 per cent.

The Purchase and Storage of Surplus Eggs—1942 Season.

Owing to the fact that there is no likelihood to export any of the Union's surplus production of eggs during the coming season, it has been decided that the Controller of Food Supplies will purchase any surplus eggs from producers and producers' organizations which cannot dispose of their surplus eggs through the normal channels. In the Transvaal and Orange Free State where no such producers' organizations exist for the sale of eggs, it will be necessary to establish some form of organization through which producers would be able to offer their eggs for sale to the Controller of Food Supplies. All eggs offered for sale to the Controller must, however, be packed in standard export boxes and must comply with first quality export specifications. The following prices will be paid for these:—

Large (24 ozs. to the dozen): 1s. 5d. per doz.
Medium (21 ozs. to the dozen): 1s. 3d. per doz.

In addition to the above prices an allowance, of not exceeding 2d. per dozen, will be paid for the cost of boxes, flats and fillers. The above prices will be paid for unlimited quantities at Johannesburg, Durban and Cape Town, and for limited quantities at Pretoria, Bloemfontein, Port Elizabeth and Pietermaritzburg. For quantities in excess of the normal requirements in areas where limited quantities will be taken, it would be a condition that the organizations concerned pay railage to either Cape Town, Durban or Johannesburg, where unlimited quantities will be purchased.

Producers or producer organizations wishing to dispose of their eggs must communicate with the Controller of Food Supplies, Purchasing Section, Union Buildings, Pretoria.

Eggs in Cold Storage.—In order to eliminate speculation in eggs, all eggs placed in cold storage for consumption during January to June, 1943, must be stamped "chilled". The maximum wholesale and retail prices, at which these eggs may be offered for sale, will be fixed by the Controller of Prices on the basis of the prices actually paid to producers during the season of plentiful production.

Index of Prices Paid for Farming Requisites.

Year and Month.	Implements. (a)	Fertilizers. (b)	Fuel. (c)	Bags. (d)	Feeding Stuffs. (e)	Fencing Material (f)	Dipping and Spraying Material. (g)	Building Material. (h)
Base—								
1936–38...	100	100	100	100	100	100	100	100
1939......	105	106	98	146	90	114	100	103
1940......	120	139	117	171	95	176	112	124
1941—								
January...	124	166	121	152	99	192	113	128
April......	125	166	125	174	109	198	114	136
July.......	125	173	125	182	114	210	117	151
October...	122	173	125	192	114	231	117	162
1942—								
January (j)	121	146	125	188	115	229	117	164
April......	122	146	134	194	127	228	117	165
July.......	124	146	146	199	154	235	118	166

The following is the composition of the above groups. (The items are weighted according to their respective importance) :—

(a) Ploughs, planters, seed drills, harrows, cultivators, ridgers, mowers, binders-hay rakes, silage cutters, hammer mills, separators, windmills, shares, land, sides, mouldboards, knife, pitman, guard.
(b) Superphosphate, ammonoium sulphate, potash, muriate, bonemeal.
(c) Petrol, power paraffin, crude oil, grease, lubricating oil.
(d) Woolpacks, grain bags, sail twine, binder twine.
(e) Mealies, bran, oats, lucerne, groundnut-oil cake, bonemeal, salt.
(f) Fencing wire, standards, baling wire.
(g) Bordeau mixture, lime sulphur, arsenate of lead, cyanogas, Cooper's sheep dip, Little's dip, Tixol cattle dip.
(h) Corrugated iron, deals, cement, lime, flooring boards.
(j) Preliminary.

Average Prices of Potatoes and Onions on Municipal Markets.

SEASON (1st July to 30th June).	POTATOES (150 lb.).						ONIONS (120 lb.).		
	Johannesburg.				Cape Town.	Durban.	Johannesburg.	Johannesburg.	Cape Town.
	Transvaal. No. 1.	Transvaal No. 2.	N.M. Grade 1. No. 2.	N.M. Grade 1. No. 3.	Cape No. 1.	Natal No. 1.	Transvaal.	Cape.	Cape.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
1938–39.........	6 9	6 2	8 10	8 1	8 3	8 10	8 3	8 10	7 4
1940–41.........	14 2	13 4	18 6	18 5	15 7	16 10	12 5	12 3	9 10
1941—									
January.......	11 4	10 1	12 4	11 7	10 2	14 4	7 3	7 3	4 7
February......	8 9	8 2	12 1	11 9	14 2	11 0	6 9	7 4	4 10
March.........	10 10	10 7	13 9	13 8	13 0	13 5	8 1	8 10	5 4
April..........	14 8	14 10	19 9	19 0	19 4	17 11	8 11	9 9	7 8
May...........	15 3	14 4	21 1	20 11	16 9	17 11	9 9	10 3	7 6
June..........	17 9	17 10	22 10	22 7	18 2	21 4	10 8	13 2	9 5
July...........	22 9	23 5	28 0	28 5	26 8	27 6	16 1	16 1	12 11
August........	18 10	19 10	26 10	27 2	24 8	24 9	13 0	19 0	15 3
September.....	19 2	20 1	25 1	24 8	28 0	26 7	17 1	16 9	13 9
October........	26 0	24 10	28 8	28 8	33 5	29 8	11 3	17 1	12 11
November......	25 0	24 3	34 1	32 11	26 10	29 8	9 1	—	10 1
December......	21 5	20 1	22 2	21 11	14 9	24 8	10 3	12 4	8 1
1942—									
January.......	18 8	16 4	20 6	18 11	15 3	23 2	9 3	10 2	7 10
February......	15 9	13 11	20 11	20 5	16 3	20 3	9 10	9 9	7 0
March.........	16 6	15 2	21 4	21 7	18 4	21 3	8 9	9 5	6 7
April..........	14 6	13 4	21 1	21 2	19 9	18 2	11 9	12 10	7 6
May...........	15 11	16 1	21 7	21 11	20 2	18 7	11 9	12 10	10 10
June..........	17 10	17 6	22 3	22 10	17 10	20 4	14 0	14 6	11 7
July...........	17 0	17 1	21 0	22 8	19 6	19 6	13 7	14 10	12 10

Index of Prices of Field Crops and Animal Products.

(Basic period 1936-37 to 1938-39 = 100.)

SEASON (1st July to 30th June).	Summer Cereals, (a)	Winter Cereals. (b)	Hay. (c)	Other Field Crops. (d)	Pastoral Products. (e)	Dairy Products. (f)	Slaughter Stock. (g)	Poultry and Poultry Products. (h)	Combined Index.
WEIGHTS.	19	13	2	3	34	6	17	6	100
1936–37..........	118	86	94	93	122	86	89	98	106
1937–38..........	89	106	112	118	98	112	105	107	101
1938–39..........	92	107	96	89	79	102	106	94	93
1939–40..........	86	106	77	93	116	105	106	89	104
1940–41..........	109	113	106	159	103	108	110	112	109
1941–									
January........	121	115	98	121	100	104	115	96	109
February.......	122	115	92	115	100	104	112	107	109
March..........	135	115	87	125	100	104	105	125	112
April..........	126	116	98	167	101	106	108	151	114
May............	112	116	125	160	101	109	108	157	112
June...........	110	116	126	183	101	111	111	150	113
July...........	112	118	128	241	100	130	118	145	117
August.........	111	118	132	216	100	130	119	103	114
September......	118	118	154	228	100	130	128	108	118
October........	124	119	138	268	100	128	135	115	121
November......	124	137	110	250	100	128	140	118	124
December......	127	137	135	199	100	122	147	128	125
1942—									
January........	131	137	126	180	100	122	144	141	125
February.......	132	138	125	168	101	130	140	147	125
March..........	126	140	140	175	101	130	134	168	125
April..........	126	139	151	170	102	130	129	175	125
May............	158	139	188	181	102	154	132	203	136
June...........	159	139	207	186	101	154	140	218	138
July...........	159	139	183	184	116	167	154	163	143

(a) Maize and kaffircorn.
(b) Wheat, oats and rye.
(c) Lucerne and teff hay.
(d) Potatoes, sweet potatoes, onions and dried beans.
(e) Wool, mohair, hides and skins
(f) Butterfat, cheese milk and condensing milk.
(g) Cattle, sheep and pigs.
(h) Fowls, turkeys and eggs.

Average Prices of Oranges and Pawpaws on Municipal Markets.

SEASON (1st April to 31st March).	ORANGES (Pocket).							PAWPAWS (Standard box).	
	Johannesburg.			Cape Town.		Durban.		Johannesburg.	
	N.M. Navels.	Other. Navels.	Other. Valencias.	Navels.	Valencias.	Navels.	Valencias.	N.M.	Other.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
1938–39..........	1 10	1 6	1 5	2 0	2 1	—	—	2 0	1 7
1940–41..........	1 9	1 7	1 6	1 11	1 10	2 4	2 1	2 2	1 9
1941–42..........	1 9	1 8	2 6	1 10	2 5	1 11	2 1	2 1	1 10
1941—									
January........	—	0 11	1 9	—	1 10	—	2 11	2 6	1 6
February.......	—	2 2	2 2	—	2 9	—	—	3 7	2 10
March..........	—	2 3	2 10	3 0	2 9	2 9	—	3 5	2 7
April..........	1 9	1 8	1 5	2 5	1 11	2 1	—	2 7	2 1
May............	1 9	1 5	1 4	1 7	1 0	2 2	—	2 0	1 6
June...........	1 8	1 6	1 3	1 7	—	1 8	—	1 6	1 4
July...........	1 8	1 7	1 3	1 8	—	1 11	1 6	1 5	1 2
August.........	2 2	2 2	1 7	1 11	1 6	1 10	1 8	1 11	1 8
September......	2 4	2 1	1 9	2 4	1 8	2 6	1 8	1 9	1 5
October........	—	1 10	1 11	3 2	1 9	3 5	1 8	2 3	1 10
November......	—	2 9	2 8	3 1	2 7	—	2 5	3 2	2 6
December......	—	2 9	3 6	—	3 5	—	2 6	3 9	2 7
1942—									
January........	—	2 6	3 8	2 10	4 7	—	3 11	3 8	2 1
February.......	—	3 11	4 5	4 7	6 10	3 9	5 8	6 4	3 3
March..........	—	3 7	2 11	6 6	5 10	4 3	5 6	4 1	3 1
April..........	2 1	2 0	1 10	3 4	5 0	3 4	2 6	4 0	3 1
May............	2 4	2 3	2 1	2 3	2 3	2 6	1 2	3 8	3 1
June...........	2 3	2 3	1 9	2 1	—	2 6	1 11	2 11	2 5
July...........	2 5	2 5	1 11	2 1	—	2 8	1 0	2 8	2 2

Special Production Number

Foreword by Dr. J. S. Marais, Director of Publicity.

In this issue of "Farming in South Africa" which is especially devoted to articles on food production, the Food Control Organization is furnishing a short résumé of the information at present available and appropriate in regard to the most important directions in which food production may be stimulated and waste eliminated.

When the Organization was set up in May last, the sowing seasons for most products in the summer-rainfall area were practically at an end, but the interval has been utilized to the full to put the organization into operation, to apply certain control measures and to establish the necessary contact with producers.

With a view to promoting the necessary production in adapted areas, the Director of Production has divided the Union into separate areas, with a Regional Officer for each area.

The publicity work with which I have been charged necessitates a considerable amount of travelling about and addressing of meetings in order to establish contact with farmers and other organizations. In addition, machinery had to be put into operation for disseminating essential information in connection with those branches of farming which must be harnessed to ensure increased production. The agricultural radio service of the Department was organized in such a manner that essential information is broadcast twice a week (on Mondays and Fridays at 6.50 p.m.); furthermore, a talk to women is also given every Wednesday afternoon. Subsequently this information is made available in the form of a Publicity Series to the Press and regional officers, as well as to farmers' associations and special agricultural committees.

I therefore wish to avail myself of this opportunity to express appreciation, on behalf of the Food Controller and his organization, to the Broadcasting Corporation, the Press and the collaborating farmers' organizations for their assistance and sympathetic attitude towards this national service to the people and the State.

The articles in this issue of "Farming in South Africa" are, in the nature of things, more applicable to the summer-rainfall area, where the sowing period has now commenced. Special attention will be devoted to the winter-rainfall area early next year.

Since these articles constitute a short summary of the available information on those undertakings which should be encouraged and the directions in which economy should be effected, these articles will undoubtedly be a useful guide not only to farmers but also to the officials concerned.

J. S. Marais.

Director of Publicity.

Information on Departmental Publications.

Farming in South Africa, the monthly journal of the Department, contains popular as well as scientific articles on a variety of agricultural topics, useful to both the farmer and the housewife, while the **Crops and Markets** Section, supplies information on crop prospects, market prices and exports of agricultural produce.

The following particulars in regard to subscriptions and advertisements should be noted:—

Subscription.—Within the Union, South West Africa, Bechuanaland Protectorate, Southern Rhodesia, Swaziland, Basutoland, Mocambique, Angola, Belgian Congo, and British Territories in Africa 5s. (otherwise 7s. 6d.) per annum, post free, payable in advance.

Applications, with subscriptions, to be sent to the Government Printer, Koch Street, Pretoria.

Advertisements.—*The Tariff for Classified Advertisements is:* 2d. (two pence) a word with a minimum of 5s. per advertisement (prepaid). Repeats, not entailing any change in the wording, will be published at half the cost of the original.

Conditions:—

(1) The advertisement will be classified under specific headings, and only one black letter (initial letter) is permitted.

(2) Advertisements in which prices are mentioned must contain the name and address of the advertiser. A nom-de-plume or box number only is not sufficient, and unless this condition is strictly observed advertisements will not be accepted.

(3) Advertisements will be classified strictly in accordance with the subject-matter of the announcement, determined by the first item mentioned, and cannot be inserted under irrelevant headings.

(4) Displayed, classified advertisements will also be accepted. The charge however, will be 15s. per inch, single column, per insertion, without reduction for repeats.

Copy for Advertisements to be in the hands of the Government Printer, Pretoria, not later than the 20th of the month preceding publication.

Send all advertisements direct to the Government Printer, or write to him for details as to tariff for advertisements.

Popular Bulletins.—Bulletins on various agricultural topics are published by the Department to meet public demand. A list of available bulletins giving particulars of cost, etc., is obtainable free of charge from the Editor, Department of Agriculture and Forestry, Pretoria.

Scientific Publications.—From time to time the different Divisions of the Department issue science bulletins incorporating the results of research work conducted by them. Other scientific publications issued are: "The Onderstepoort Journal", "Memoirs of the Botanical Survey of South Africa", "Bothalia", "Entomological Memoirs" and the "Annual Reports of the Low Temperature Research Institute". Information in regard to these publications is obtainable from the Editor, Department of Agriculture and Forestry, Pretoria.

Press Service.—The Press of South Africa is now supplied with a bulletin of agricultural information for their exclusive use. This information is published fortnightly by all newspapers and other journals throughout the country.

Farmer's Radio Service.—In addition to the printed information supplied by the Department to members of the farming community, the Department, in collaboration with the South African Broadcasting Corporation, also maintains a daily broadcasting service to farmers. Information in regard to times of broadcasting is contained in the programmes issued by the Broadcasting Corporation.

Inquiries.—All general inquiries in regard to the publications of the Department, including the Radio Service, should be addressed to the Editor, Department of Agriculture and Forestry, Pretoria.

D. J. SEYMORE, Editor

FARMING IN SOUTH ... AFRICA

Vol. 17 OCTOBER 1942 No. 199

Editorial:

Soil Conservation in the Face of Increased Production.

In my capacity as Director of Production I have made repeated appeals to our farming community to make every effort to produce food for man and beast in this country. This issue of "Farming in South Africa" is devoted to articles on methods of production for the summer-rainfall area. I feel, however, that, in spite of the urgent appeals for increased production, a serious warning will not be misplaced at this juncture.

A nation which allows its soil cover to be destroyed is in the process of destroying itself. The soil is the main source not only of food but also of most of the necessities of life. Soil is essential for life. Lack of the necessary interest in this valuable possession, makes us blind to the serious menace to our animal production which arises from the geo-pathological consequences of neglect and destruction of our soil cover.

The progress of any nation depends more on the fertility of its soil and the preservation of its natural cover than on any other physical factors. A study of the agriculture of older nations has shown that this is an indisputable fact. Our nation is still relatively young. Ever since our ancestors started cultivating our soil, however, there has been a decline in its fertility. This increasing loss of productivity is the result of continuous exhaustion of the soil by crops, poor methods of cultivation, insufficient conservation of farm manure and other vegetable waste, the lack of leguminous crops, inadequate attention to methods of controlling soil erosion and man's desire to get as much as possible out of the soil without in any way restoring to it something to make good its gradual loss. These facts make us realize the importance of conserving soil fertility, and if the coming generation fails to devote more attention to it than the last generation, it will mean that our soil will deteriorate until eventually we shall find it difficult to produce sufficient food for our own needs.

Living, as we do, in a country so richly endowed with natural vegetation and in which soil erosion— for which we human beings are responsible— is depriving us of a priceless heritage, we cannot allow the present disturbed times to deprive us of our sense of proportion. In other words, we must not use this call for increased production and the consequent possibilities of financial gain as an excuse for absolving us from our responsibility for preserving our soil.

The serious appeal by the controller of Food Supplies for increased production should therefore be regarded as qualified by a warning to farmers not to make themselves guilty of exploitational cropping but to apply sound farming practice as indicated in the many articles in this issue. In this way they will be able to bring about a considerable increase in production while at the same time preserving our greatest national asset.

(A. M. Bosman, Director of Production.)

How to Make Good Veld Hay.

J. P. Botha, Pasture Research Officer, Athole Experiment Station.

DESPITE the fact that the natural grazing of the Union regularly yields large quantities of surplus plant material, it happens every year that stock die in thousands of direct or indirect starvation. If utilized in the form of hay, this surplus grass could considerably reduce these unnecessarily high losses and would enable thousands of

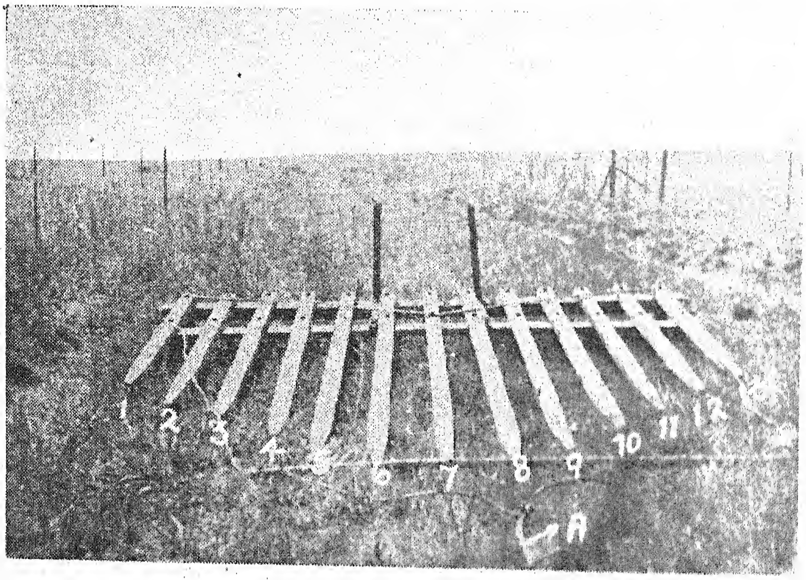

Fig. 1.—Hay-sweep for collecting veld hay.

farm animals which are with great difficulty merely kept alive during winter to survive that season in good condition.

Hay instead of Winter Grazing.

Veld hay can be made in any part of the Union where the natural grassveld can be mowed and the grass is suitable. In the sour and mixed grassveld areas, hay-making is of much greater importance than in the bushveld and other sweet grassveld areas. Sour grass loses its palatibility and to a large extent also its nutritive value as soon as it reaches maturity. Consequently, sour veld is of little value during the winter months, unless the grass is cut in summer and preserved in the form of hay. To a lesser degree, this also applies to mixed grassveld. In the latter case, animals can admittedly exist on the winter veld, but as a rule are then in such poor condition in spring, that it would have been much better to use the veld for hay than for winter grazing.

In the sweetveld areas the loss of palatability and nutritive value is much smaller than in the case of sour veld; consequently the veld can be kept in reserve during summer and grazed during winter with good results. In these cases the making of veld hay is not so important. As a rule, however, the sweetveld areas are much more subject to drought, since, the rainfall being irregular, periods of abundance are only too often followed by times of serious scarcity. The surplus grass can be preserved in the form of hay without much

trouble, and in this way valuable feed reserves can be built up for periods of drought out of material most of which would otherwise be wasted.

There are no grounds for the prejudice against veld hay so often displayed by farmers. The contention that the low yields of hay are not profitable, is based on an imperfect realization of the principles of veld control. Veld which has been cut not only yields the hay thus obtained, but gives more and better grazing during the following season.

The Correct Stage for Cutting.

The younger the grass, the higher its protein and phosphorus content, and the more digestible the cellulose. As the grass becomes older, there is a gradual loss in respect of the first-mentioned two constituents, while the cellulose becomes less digestible. In other words, the younger the grass, the higher its nutritive value and the better will be the hay made from it. On the other hand, it is also true that the younger the grass, the smaller the yield of hay and, as a result, the higher the cost of making it. It is, therefore, best to cut the grass at a stage when the yield will not be too low and the nutritive value will still be adequate.

As a general rule the early flowering stage has been found to be the correct time for cutting. Grass which has almost reached the mature stage is not suitable for good hay, alhough it can sometimes be used as a stand-by and is in any case better than nothing at all.

Treatment of the Grass.

There are various methods of treating the grass, of which the following will be found the easiest and cheapest. The grass should be cut on a sunny day and left on the veld until it begins to dry. Rainy days and misty weather are not suitable. When the grass is no longer damp to the touch, yet is not sufficiently dry to break when a handful is twisted, it can be raked together in stooks. On a warm day, exposure to the sun for 2 to 3 hours is usually adequate. It is essential not to allow the grass to become too dry before raking it together, since a certain degree of moisture is needed for proper curing of the hay. Hay does not merely consist of well-dried grass, which lacks the characteristic smell, colour and palatability of good hay. In addition, hay which has been exposed to the sun for too long a period will lose a large percentage of its carotine content. Grass which is too damp, however, generates too great a heat in the stack as a result of which the hay becomes mouldy and unpalatable.

In the case of very short grass, the usual hayrake is not always very effective since the short grass slips through the prongs. This difficulty can be overcome by fixing strips of smooth galvanized iron, approximately 2½ inches broad, to the prongs in such a way that the open spaces between the prongs are reduced to about ½ inch each. In the case of veld hay it is necessary to make drying cocks, but the grass may be raked together with a hay sweep (Fig. 1) immediately after completion of the stooks and carted away. The hay must be stacked immediately. It is essential that all the hay cut during the day should be stacked before the same evening. It has been found that wide stacks are liable to generate too much heat as a result of which the hay becomes mouldy. A width of approximately 12 feet is most satisfactory.

A simple curing shed for the treatment of hay has been designed at the Estcourt Pasture Research Station. Immediately after being

cut, the grass is raked together and transported to the shed where it is stacked in such a way that a free passage is left for air from the centre of the stack to the top, and at intervals of 3 feet from the bottom upwards, air passages of wire mesh lead to the centre through the stack. This method of ventilation prevents the development of too high a temperature. After having been left in the shed for a week,

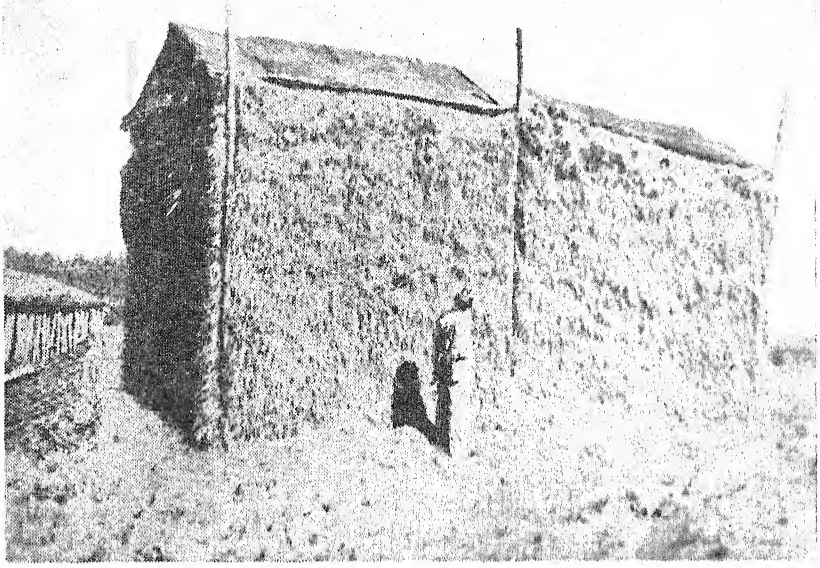

Fig. 2.—Veld hay under cover at the Athole Research Station.

the hay is ready to be removed and stacked. Two great advantages are attached to this method, viz:—

(1) The hay is not exposed to the hot sun; consequently, a greener and more fragrant product is obtained.

(2) The hay is brought under cover immediately, so that in the case of a sudden change in the weather there is less risk of loss.

Farmers are advised to write direct to the Officer in Charge, Pasture Research Station, Estcourt, for a plan of the shed.

The Storage of Veld Hay.

It is essential for stacks of veld hay to be covered as a protection against rain. No matter how well a stack has been built up, veld grass will allow water to penetrate from the top when it rains, with the result that large portions of the stack will become unfit for use.

A simple method of preservation is to build up a stack between poles driven into the ground (Fig. 2) and to place a light movable roof over the top, securing it to the poles. The roof shown in the photograph is made of hessian treated with coal-tar, but owing to the present shortage of this material it will be better to cover the stack with grass.

Crop-production Policy in the Present Emergency.

Dr. A. R. Saunders, Deputy-Director of Production.

THE relatively high prices ruling for most agricultural products and the inducement to farmers to produce more in order to meet increased demands may prove mixed blessings unless a sound perspective is preserved in regard to the many factors involved.

Basically the main object in view, viz. increased food supplies, should be striven for by an intensification of rational production rather than by deviations into channels of farming in which the producer may be inexperienced. In the case of highly perishable crops, such as vegetables, which cannot be economically transported over long distances, a " go-slow " policy may even have to be followed in certain areas, depending upon the absorption capacity of the nearest markets.

Dislocation of established systems of farming should be avoided as far as possible, particularly when new and temporarily remunerative enterprises require an appreciable capital outlay. The cost of redressing the balance later when conditions are more normal may far exceed the advantages of the moment and it would be wisdom to take the long view.

Economic Crops.

In the main, preferance should be given to those crops which can be most economically produced, with due regard to the limitations imposed by soil and climate. This does not necessarily mean that the relative areas under different crops should remain the same as in the past. On the contrary, there is room for many changes which will be of lasting benefit, and the present is as good a time as any to make them. A case in point is the introduction of more legumes into the farming system to provide much-needed protein-rich feed for livestock and to maintain the fertility of the soil or assist in arresting its decline.

Suitable Fertilizers.

Exploitation of the soil under pressure of increased demand for plant products is probably not entirely avoidable, but to ignore its implications may bring sharp retribution in the course of time. The careful preservation of available supplies of kraalmanure together with the making of a compost wherever possible, especially for use on irrigated lands, rarely fails to pay for the labour and effort applied and *has become an urgent necessity owing to the shortage of artificial fertilizers.*

In this connection the farmer should acquaint himself fully with the correct use of the standard fertilizer mixtures now on the market. Although a wrong mixture may not actually do any harm to the crop it may fail to achieve the desired result or at least entail an unnecessary expenditure on plant food substances in respect of which the natural supplies in the soil are adequate. Furthermore, a point of great importance and one which needs to be clearly understood is that when a particular mixture is designated as the most suitable for a certain crop, it does not mean that this mixture should be applied wherever the crop is grown. A good example is the case of potatoes. The fertilizer mixture recommended rightly contains a good deal of potash, yet under dryland conditions in certain areas the inclusion of potash in the fertilizer application produces no

increase in yield and its use is therefore unwarranted. By far the greatest need is still that of phosphate.

Method of Cultivation.

Unnecessary ploughing of the soil should be avoided both from the point of view of reducing working costs and preserving the humus supply. The use of the plough is expensive when the main object is weed control, and under a system of good farm management, the disc harrow or tine cultivator can perform this type of work not only much more cheaply but also more efficiently, for ploughing brings a fresh crop of weed seeds to the surface of the soil. The essence of cheap and successful cultivation lies in destroying as many weed seeds as possible in the upper 3 or 4 inches of soil before the crop is planted.

The wholesale ploughing up of virgin soil needs to be strongly discouraged, especially if the destruction of valuable grazing is involved. The restoration of such grazing at some future date will prove costly and take time. Moreover, an increase in the area under cultivation will put an added strain on an already fully strained labour supply. With better methods of cultivation greatly increased production is possible on an even smaller area than that at present put to the plough.

No attempt at increased production would be fundamentally sound unless it is based on methods which will ensure stability of yield in so far as the vagaries of Nature will allow. Reasonably good crop yields during poor seasons are of far greater importance than exceptionally high returns under conditions of favourable rainfall. In this regard the necessity for relatively wide spacing of maize and similar crops in areas of uncertain rainfall deserves particular emphasis. Yet wide spacing alone will not give the crop greater drought endurance; weeds have the same adverse effect as too close spacing. Clean cultivation combined with relatively wide spacing constitutes one of the best assurances against drought.

Good Seed.

Another requisite of good farming whether in time of war or in peace is the use of good seed of adapted varieties. As a group, our farmers are not yet fully conscious of the value of good seed. Owing to shortages in the supply of certain seeds on account of the war, self-sufficiency in large measure should be the aim of every farmer. In the majority of cases this should not be a difficult undertaking, and with the exception of potatoes and other vegetables, ample provision for seed of our major crops can and ought to be made in good time for next season's planting.

Although the goal of increased production is important enough, the means of reaching that goal should be assured if success is to be achieved. The state is doing everything in its power to ensure that adequate supplies of implements, fertilizers, bags and other farming requisites are made available, but shortages are bound to occur, and it is therefore incumbent upon all farmers to take the best possible care of their implements and machinery and to avoid waste of bags and other easily destructible items.

Finally, the fact must be faced that a period of depression is likely to follow some time after the war and the sooner the farming community starts making provision for such a time the better. The eventual survival of many farmers will depend upon the extent to which they are able and enterprising enough to capitalise the present favourable conditions created by increased demand, and enhanced prices for their products and upon the assiduity they display in the application of scientific farming methods.

Utilization of the Maize Crop in South Africa.

D. J. van den Berg, Professional Officer, Kroonstad Summer Experiment Station.

IN South Africa maize is grown mainly for its value as a grain. The grain constitutes approximately 40 per cent. of the total dry weight of the plant; the remaining 60 per cent. is generally wasted or used uneconomically. After the grain or cobs have been removed, this portion of the plant is usually left on the lands where it is dried

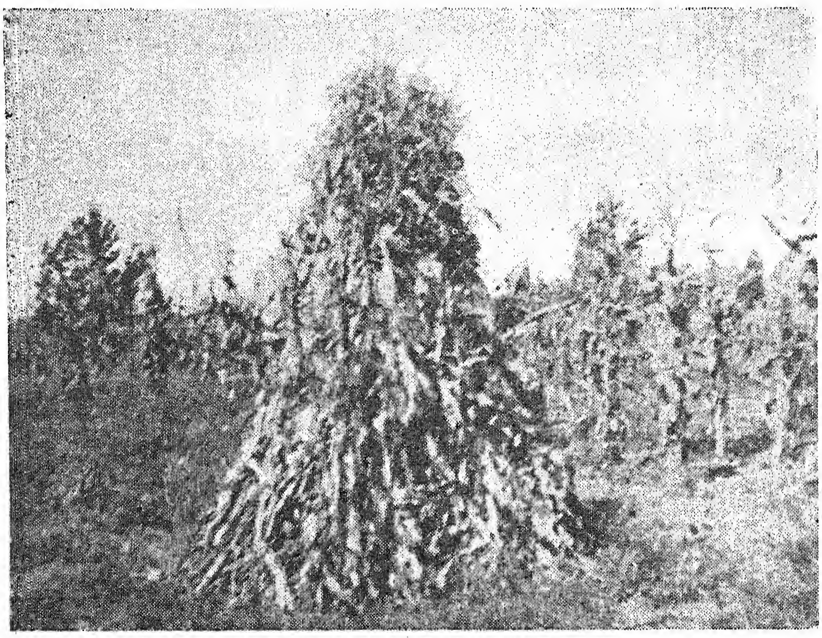

FIG. 1.—A well-packed stook in which the plants with unpicked cobs are allowed to dry.

out by the sun and further damaged by the wind and by the trampling of animals. In this hard, fibrous and neglected condition the stalks form a very poor maintenance ration for animals. Such stalk lands can carry cattle only for 80 to 90 days at the rate of one head per morgen, their grazing value being at present estimated at 9s. per morgen. Animals usually lose weight if they are kept on this type of grazing alone during the winter months and this explains the general poor condition of cattle during winter, especially in the maize growing areas of the Union.

As soon as the grain reaches the advanced doughy or glazed stage during autumn, the stalks should be cut and stacked in conical stooks of approximately 10 feet diameter and tied with strong twine or baling wire. In this position the plants will retain a large percentage of their leaves, plumes and nutritive value. It has been found at the Kroonstad Experiment Station that with such treatment the same field will maintain double the number of animals in better condition than if it were grazed.

Cultural Methods.

The lands are cultivated in the same way as for an ordinary maize crop with the exception that when the stage is reached where the grain turns hard or flinty, the whole plant is cut just above the ground. During ordinary warm and dry weather the plants can be stacked immediately in conical stooks but during moist or overcast weather it is advisable to allow the stalks to dry for a day in small bundles.

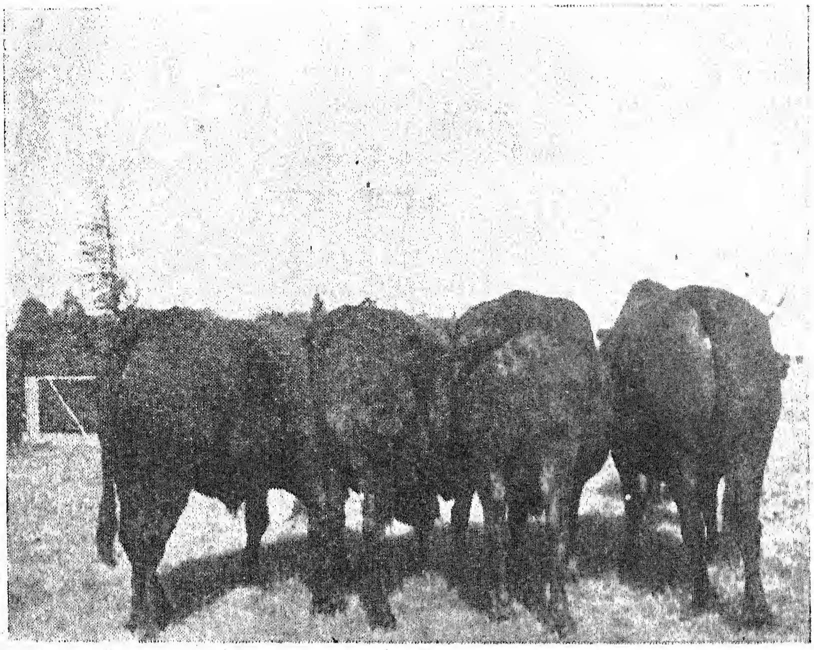

FIG. 2.—Four trek-oxen fattened, during the last 50 days, on a ration consisting of 40 per cent. silage, 60 per cent. shredded maize plants, 5 lb. cowpea hay and 5 lb. yellow mealiemeal.

The cost of labour for cutting and stacking is approximately 4s. 6d. per morgen but this expense is justified by the increased nutritive value of the stover. Furthermore, the field is cleared at an early date so that winter ploughing can be practised between the rows of stooks. This is a great advantage in the effective division of man and ox labour. In addition, if the stalks are cut before the 15th of April, i.e., before the stalk-borer has descended to the roots, the fields are also largely freed of stalk-borer infestation.

Methods of Utilization.

After about two months the cobs in the stooks will be thoroughly dry and can then be picked from the stalks. This practice is regarded as undesirable, however, owing to the increase in production costs which it involves. The cost of picking the cobs from stooks will be approximately 4s. 4d. per morgen as compared with 2s. 10d. for ordinary reaping.

A sound crop-production policy which aims at the maintenance of soil fertility and the establishment of a permanent and well-organized farming system should include a judicious system of stock breeding. From this point of view, the most effective utilization of

the maize crop is the consumption of the whole plant: stem, leaves, plume, and grain. A valuable method of doing this is to remove the plants from the conical stooks and to crush or grind them in a hammer mill with a one inch mesh. The grinding of this dry material often results in considerable waste so that it is better to crush it than to pulverize it. To obtain the desired product the right type of hammer mill should be used, since the speed at which it is run, the length and type of hammer, etc., are important factors. For

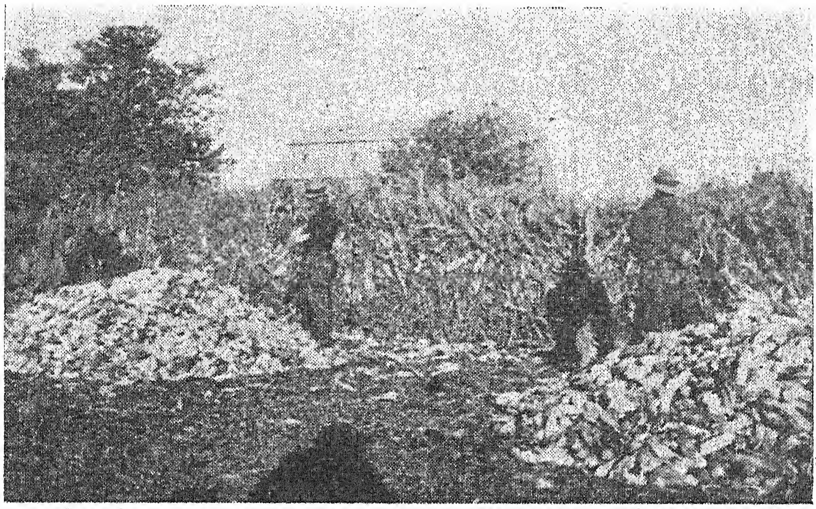

FIG. 3.—Cobs being picked from stalks stacked in rows.

the best results this roughage can, on account of its high carbohydrate content, be supplemented with protein-rich feeds, the quantity of which will depend on the quality, age, and type of animal to be fed. This type of roughage can be produced very economically in the maize-growing areas and is surpassed by practically no other hay or fodder crop under dryland conditions. Yields of 8 tons per morgen have often been obtained at Kroonstad and 6 tons per morgen may be regarded as an average yield. The cost of carting stalks from the land is fairly high and the cost of transport can, therefore, be reduced considerably by cutting the material on the land and removing it in bags. The cost of grinding will amount to approximately 4s. 6d. per ton if labour, fuel, depreciation of tractor and mill are included. The total additional expense over and above the usual production costs of maize will be approximately 5s. 3d. per ton of ground material. If 60 per cent. of these crushed maize plants is mixed with 40 per cent. silage and supplemented with 4 to 7 lbs. of cowpea, soyabean, or lucerne hay or with 1 to 2 lbs. of groundnut meal, an excellent and inexpensive ration is obtained for fattening oxen and other large farm animals. The supplementary requirements will depend largely on the age of the animals and on whether the feed is used for maintenance or for fattening purposes.

It is felt that the methods of utilizing maize crops in South Africa can still be greatly improved and that the adoption of the advice given above will annually save thousands of tons of feed which would otherwise be lost.

The Composition of Protein-Concentrate Rations for Dairy Cows.

J. C. Bonsma, Animal Husbandry Research Officer, Division of Animal and Crop Production.

MOST dairy farmers have heard so much about proteins lately that they have probably become "protein-conscious", but now they would naturally like to know what the protein percentage of a concentrate should be. Should the concentrate, for example, contain 16 per cent., 18 per cent., or 20 per cent. protein?

There are many kinds of proteins, all differing as much in their origin as in their properties and the results which they produce. Consequently, it is not the protein percentage alone which determines the value of a protein concentrate, but the correct balance of a variety of proteins.

Nobody knows precisely what the correct balance in a concentrate should be, but the results obtained from a cow over a period of time will give a fairly accurate indication of what that balance should be. A combination of green and leguminous products will not give the best protein concentrate.

Animal Proteins Essential.

Vegetable proteins must be supplemented with some animal protein such as, for example, white fish meal or blood meal of good quality.

It has been conclusively proved that large dairy herds require considerably less concentrates and show a notable increase in milk production when an animal protein is added to a concentrate mixture containing only vegetable proteins. The value of a protein mixture is increased by mixing a variety of cereals and leguminous by-products, and a further great improvement is effected by adding an animal protein such as good white fish meal or blood meal. This improvement in the quality of the concentrate ration may be explained as follows:—

Animal proteins, unlike vegetable proteins, are rich in the four amino acids which are indispensable to animals, viz., lysine, tryptophane, cystine and histidine. Consequently the addition of animal proteins supplements the deficiencies in a vegetable-protein concentrate.

If the proteins in a concentrate ration are carefully selected with due regard to their nature and origin, their percentage need not be so high nor will the cows require as much of the mixture, since the animal body can utilize a properly mixed concentrate ration to better advantage.

Effect of Unbalanced Rations.

Feeding cows with an abundance of concentrates of a high protein value in which the amino acids are often unbalanced, will inevitably result in a large accumulation of superfluous unassimilated amino acids of certain kinds in the animal body, from which they must be excreted. This means that the superfluous amino acids are simply wasted and may even be detrimental to the cow. It may be presumed that their presence in the blood will disturb the balance of fluids in the body and even of milk production.

An excess of maize in unbalanced rations often causes kidney trouble in the herd. That is why experienced farmers reduce the

 [Continued on page 626.

Legumes in Crop Rotation.

Dr. A. R. Saunders, Deputy-Director of Production.

THE practice of growing legumes in rotation with other crops is centuries old and forms an integral part of well established agricultural systems. Its foundation is not only the value of the crops as food for man and beast, but also their ability to take nitrogen from the air and fix it in the soil through the agency of symbiotic, nodule-forming bacteria.

In South Africa, the percentage of cultivated land planted to legumes is still deplorably small. Throughout most of the summer rainfall area it is generally less than 2 per cent. and seldom exceeds 5 per cent. Even under normal peace-time conditions such a situation should give grounds for serious concern, and under the present circumstances it demands the earnest attention of all who have the interests of agriculture at heart.

There is, in fact, an imperative necessity that more legumes should be grown, for two main reasons: (1) the shortage of protein-rich concentrates, and (2) the difficult position which obtains in regard to fertilizer supplies, especially that of nitrogen. The use of high protein concentrates has greatly increased during the past few years in the feeding of dairy cattle and other animals. More dairy products are required in the interests of the nation's health and more feed rich in protein is therefore needed. Unfortunately we have in the past been, and still are to a large extent, dependent upon imported supplies of either the raw material from which protein-rich concentrates are manufactured or of the finished product itself. Owing to shipping difficulties and the fortunes of war such supplies cannot safely be relied upon, hence a policy of self-sufficiency as far as possible is clearly the correct one to adopt.

But the goal of complete self-sufficiency in respect of such feed as oil-cake meal is, at the moment, and for some considerable time to come, out of reach, so that substitution must be resorted to. The obvious substitutes are legumes which lend themselves readily to large-scale production. For the dairy farmer or other stock feeder who produces his own feed, the situation is not difficult, since by the use of good quality leguminous hay in properly balanced rations he can virtually dispense with oil-cake meal, or at least reduce the consumption of this feed to a minimum, thus leaving the available supplies for use where they are most needed.

From the soil-fertility point of view, the production of more legumes can only have an advantageous result, and the time for arguing on theoretical issues is past. Even on soils where nitrogen in artificial form evokes no response, the growing of legumes generally has a beneficial effect on productivity. This effect may be due to a variety of causes, amongst which a significant one is doubtless the fact that legumes are apparently able to make better use of natural phosphates in the soil than most non-leguminous plants. The roots of legumes are particularly rich in phosphorus and it is not unlikely that when they decay the phosphorus becomes mineralized into a form available for the succeeding crop. It does not follow, however, that in a system of crop rotation where legumes play an important part, the addition of phosphates can be dispensed with, but rather that good results can be obtained with smaller quantities. The significance of this fact under present conditions speaks for itself.

Beans.

The best type of legume to grow will depend largely on soil and climatic conditions. In certain areas, notably the Transvaal Highveld, the various kinds of common beans, such as haricot, kidney and sugar are already important crops and increased production of desirable types can confidently be looked forward to. A common practice in harvesting these beans, or at least certain varieties, is to pull the plants by hand when they are mature. Obviously, a large proportion of the roots and therefore of fertilizing material is thereby removed, and in the interests of soil fertility it is essential that wherever possible the mature plants be cut off above or at ground level by means of sharp hoes or other suitable tools. Alternatively, if the removal of the roots is unavoidable, they should be returned to the soil later in the form of compost.

Cowpeas and Soyabeans.

Apart from lucerne, which has, perforce, to be grown mostly under irrigation, the most important legumes for hay are cowpeas and soya-beans. In the main, cowpeas are best suited to the drier parts of the summer rainfall area and soya-beans to the high rainfall localities, including the coastal belt. Both crops have the same high feeding value and are the equals of lucerne when cut at the right stage and properly cured. Their soil requirements are approximately the same as for maize, and although they respond well to phosphatic fertilizers it is suggested that such quantities as are available be used on the non-leguminous crops, leaving the legumes to depend on residues left over from previous applications.

Other Legume Varieties.

In bushveld or lowveld areas the velvet bean gives higher returns than either cowpeas or soya-beans, but it is somewhat more difficult to harvest. Another crop which deserves greater attention, especially in warmer parts of the country, is sunnhemp. The crop is completely upright in growth and has the great advantage of being very highly resistent to eelworm. It should be thickly sown and cut during the early flowering stage to prevent loss of leaf and the hay from becoming too coarse and fibrous.

Peanut hay is a valuable feed, though hay production is secondary to that of seed, and the best that farmers can do is to exercise care in curing and handling so as to prevent wastage.

Vetches offer considerable possibilities in cool moist areas, such as parts of East Griqualand and the far eastern Transvaal highveld, but seed supplies are limited and the greatest economy in their use is an absolute necessity.

Housing of Poultry.

Green yolked eggs are mostly layed after the winter or a severe drought. This condition is chiefly caused by the birds eating an excess of green feed, particularly such as all the varieties of the cabbage family or very succulant green lucerne. The addition of 3 per cent. of charcoal powder in the mash of laying hens, helps very considerably to prevent this undesirable condition in eggs.

Red-mite.—If all perches and perch joints are well brushed with sump oil once a month, red-mite will not trouble the poultry.

[E. F. Lombard, Professional Officer (Poultry), East London.]

Lucerne the Premier Hay Crop.

F. H. Bosman, Senior Research Officer, Grootfontein College of Agriculture, Middelburg, C.P.

THE importance of lucerne lies in the fact that it is a palatable protein-rich feed, that it is drought resistant, has high yielding ability and a long life. It is suitable for hay, soiling, and silage purposes and for grazing for all classes of stock. Little wonder that it is called the king of fodder crops, for few, if any, other feed plants combine so many qualities.

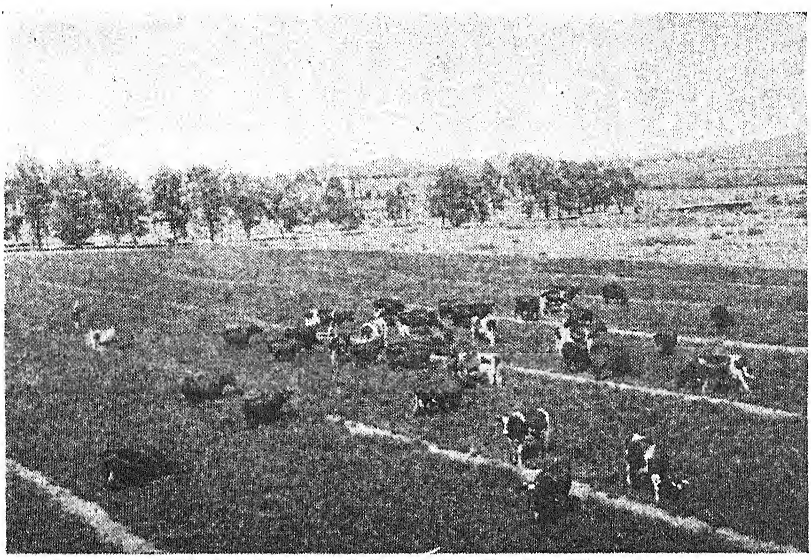

Fig 1.—Grazing of Lucerne by Cattle.

The crop is cultivated mainly in the drier parts of South Africa where irrigation water is available, although it is spreading rapidly as a dryland crop, even in the drier areas.

The cultivation of this valuable crop is urged even where conditions are not very favourable. Lack of depth of soil may shorten the life of the crop, and limitations in irrigation may limit the yield, but where there is a deficiency in protein feed, the crop will often prove economical to grow despite these shortcomings.

Because of its deep root-system the crop is able to make satisfactory use of underground water to a depth of fifteen feet or more. The occurrence of suitable underground water supplies is more frequent than is generally realized, especially in the Karroo and adjoining areas. Where this is indicated by the vegetation an attempt to establish a trial plot of dryland lucerne is usually justified.

Soil Requirements.

Favourable growing conditions under irrigation will permit four to six and, in places, even seven cuttings per season, giving total yields of 10 to 20 tons of hay or 50 to 100 tons of silage per morgen. The root system of the crop demands a deep well-drained soil; where possible, shallower and infertile soils should be avoided. A good stand is usually more readily obtained on sandy soils, but these frequently lack fertility. Heavy or clay soils, particularly those

having an impervious subsoil, are unsatisfactory for both dryland and irrigation purposes.

In the seedling stage the crop does not tolerate much alkalinity, while acidity (associated with high rainfall) is likewise undesirable. The latter condition may be modified by applications of lime.

The permanent nature of the crop justifies thorough preparation of the soil. Early ploughing is necessary to facilitate weed control, to produce a fine seed-bed, and to accumulate moisture. Because of the difficulty of applying fertilisers after the crop has been established, superphosphate, broadcast at the rate of 800 to 1,000 lb., should be ploughed under when preparing the land. A light dressing of a nitrogenous fertiliser is often advantageous at this stage.

Seed inoculation with the root-nodule organism is seldom necessary, except where the soil tends to be acid. Forty pounds of good quality seed is the normal rate of seeding and this may be modified slightly to suit conditions. The seed should be covered to a depth of ½ inch to 1½ inches by loosening the seed-bed by means of a tine cultivator and following this with a spiketooth harrow after sowing.

Irrigation.

A thorough irrigation before sowing is necessary to build up a moisture reserve in the soil and to enable final levelling to be done.

The question whether seed should be put in before or after irrigating is debatable. In trials at Grootfontein College of Agriculture sowing prior to irrigating has at all times of the year given significantly better germination than sowing after irrigating. Where the soil forms a hard crust after irrigation, post-irrigation sowing is advisable. In all such instances rolling after sowing should be practised.

Lucerne can be sown at all times of the year, provided the required moisture conditions obtain; autumn is, however, best because of the general increase in rainfall under Karoo conditions, and reduction in evaporation at that time of the year, also summer weeds are more easily controlled then. Midsummer conditions favour rapid drying of the soil, while midwinter temperatures delay germination and may cause some winter killing.

A nurse crop is not necessary, and is inadvisable on dryland. Where it is considered desirable an early maturing winter-cereal may be sown at a light rate and preferably removed before maturity.

Varieties.

The commonly grown varieties, Provence and Hunter's River, remain the most suitable for general purposes. The former is considered to be the hardier and better adapted to dryland conditions but the latter will out-yield the former by a small margin under favourable conditions.

The new crop should not be cut until well in bloom, unless weed growth necessitates this. Grazing young lucerne should be avoided. Harvesting should take place when approximately one-tenth of the crop is in bloom. Quality of hay is sacrificed if cut later than this.

Lucerne Hay.

Success in hay making is generally acquired only with experience. The process aims at drying out the lucerne sufficiently to enable stacking with the minimum loss of leaf and colour and maximum development of aroma.

Time of mowing should be determined by weather conditions, wet spells being avoided as far as possible (for silage purposes, how-

ever, cool, moist weather is desirable), and most of the dew must be off the plants before operations commence.

With favourable weather conditions raking into windrows is often possible the day following cutting, but this should not be done in the heat of the day, when the leaves are dry and brittle. Cocking is usually possible after a day in the windrows, this again being done to best advantage in the cool of the morning. The cocks should be

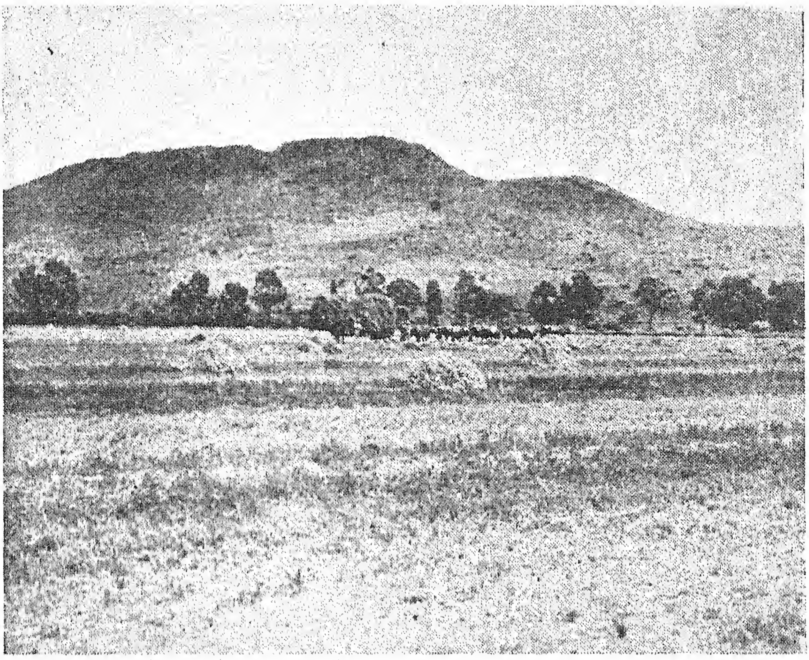

Fig. 2.—Haymaking.

tall and pointed and made on the walls of the beds. Here final drying occurs and may take from two to five days. The windrows and cocks are used to permit uniform drying of the hay and minimise loss of leaf. Before lucerne is stacked the hay must be sufficiently dry to prevent heating. Experience will enable the farmer to judge this stage by feel, otherwise reliance must be placed on the absence of moisture in the stems when these are tightly twisted, or on the firmness of the skin of the stems.

Stacks should be built on elevated and well-drained positions; when stacking the centre should be kept full to avoid sagging and consequent entry of rain.

Economic Considerations.

Lucerne can make use of large amounts of irrigation water, but the return per unit of water applied decreases appreciably with increasing irrigations. At the Grootfontein College of Agriculture over a period of 12 years an increase in yield from 12 to 22 tons of hay per morgen accompanied increases in irrigation from 18 inches to 96 inches per season, but the return per unit of water decreased from 1,248 lb. to 455 lb. The rate of irrigation must therefore be considered in relation to amount of water and arable land available.

The need to measure the irrigation stream is obvious. Applications of 6 inches per cutting should normally give fairly economical returns.

The use of lucerne as a grazing crop is increasing rapidly. Grazing, however, does not give maximum returns and shortens the life of the crop, consequently the poorest lucerne lands should be utilised for this purpose. Continued grazing at early stages of growth is most harmful, and this is followed in harmfulness by grazing during autumn, winter and spring. Midsummer grazing appears to be least harmful, but is also least useful to the farmer. Where grazing is practised, this should not be done at early stages of growth, and rotational grazing should be adopted.

The Composition of Protein-Concentrate Rations for Dairy Cows.—

[*Continued from page 620.*

concentrate rations of cows suffering from kidney trouble, since they know that this brings relief to the animals.

A Suitable Ration.

The following concentrate rations should yield good results if fed to cows in moderate quantities on farms where good legume hay is available:—

Mealiemeal, 500 lb.; maize-germ meal, 200 lb.; hominy-chop, 200 lb.; oatmeal, 100 lb.; groundnut meal, 100 lb.; copra meal, 100 lb.; white fish meal or blood meal, 50 lb.; bone meal, 2 per cent., and salt, 1 per cent. If oatmeal is not easily obtainable, lucerne meal may be used as a substitute.

This concentrate mixture need not be given to cows fed on good lucerne or legume hay, unless they yield more than 2 gallons of milk a day; in that case they should be fed $2\frac{1}{2}$ to 3 lb. of this ration for each gallon of milk produced in excess of two gallons a day. In order to prevent wastage, the present supplies of protein concentrates should be used only in properly constituted concentrate rations.

Protected Trees.

In view of the reckless destruction of certain types of trees in various districts of the north-western Cape Province, it was considered necessary to take steps for their protection. Provision was therefore made in the new Forest and Veld Conservation Act (Act No. 13 of 1941), authorizing the Governor-General to protect certain types of trees by proclamation.

The first step in this direction has already been taken by the promulgation of Proclamation No. 214 of 1941 by which the cutting of baobab trees on any land in the Union, not being Crown forest, is prohibited, as also the cutting of any of the following species of trees, viz., vaalbos, camel thorn, mimosa, withaak, swarthaak, karree and witstam, except for domestic use, in the districts of Barkly West, Hay, Herbert, Kimberley, Kuruman, Mafeking, Taungs and Vryburg.

According to Government Notice No. 1680 of 1941, any person wishing to cut down any of the above-mentioned trees should apply for permission to the Minister of Agriculture and Forestry, through the Director of Forestry, P.O. Box 334, Pretoria, from whom further particulars are obtainable.

Potato Production.

W. O. Schultz, Lecturer in Field Husbandry, College of Agriculture, Cedara, Natal.

FOR the production of potatoes, medium types of soil such as sandy and clayey loams, and red ironstone loams are the most suitable, as they produce a clean, well-shaped tuber. Good drainage is absolutely essential for potatoes and therefore heavy clay soils are unsuitable, for apart from poor drainage, they are difficult to cultivate and offer too much resistance to the free development of the tubers. Production costs in general are also higher on heavy soils than on medium soils. In humid areas heavy soils encourage the development of late blight owing to their high water-holding capacity. Sandy soils, provided they are supplied with large quantities of organic matter, can also be used for successful potato production. Soils infected with eel-worm should be avoided and if all old lands on the farm are infested, newly broken ground should be used.

Soil Preparation.

In order to produce optimum growing conditions, the soil should be in good tilth. If a field is cloddy or badly prepared this will greatly impede the development of the crop and reduce the yield.

The furrow method in which the land, after ploughing, etc., is furrowed with a potato or ridging plough, is perhaps the most common method of planting. Manure and fertilizer are spread at the bottom of the furrow, and then the seed tubers are generally placed at the side of the ridges in order to prevent damage during the process of covering, which is done by splitting the ridges with a ridging plough, or by dragging an inverted harrow over them. The splitting can also be done by hand.

In the furrow method it is very necessary to keep a balance between opening up the furrows, planting and covering of the seed. Furrows opened up far in advance of planting, dry out very quickly, and delayed covering often results in damage of the tubers through excessive exposure to heat. Patchy and unsatisfactory stands are often the result of delayed covering.

To guard against the possibility of burning from fertilizer, mix soil with the fertilizer by dragging sacks or branches through the furrows before placing the seed potatoes.

Fertilizing and Manuring.

The potato is a very heavy feeder and responds well to liberal applications of manure and fertilizer. Heavy dressings of manure and compost from 20 to 40 tons per morgen form an excellent foundation. In addition to this, artificial fertilizer should be applied at rates varying from 1,200 to 2,000 lb. per morgen. Depending on the quality of the manure or compost, this fertilizer can consist of plain superphosphate or the A. grade fertilizer mixture. Where manure or compost is not applied, potato fertilizer, as represented by Grades C, D and F of the new fertilizer mixtures, should be given at the rate of 1,200 to 2,000 lb. or more per morgen. The fertilizer treatment will naturally depend on the productive capacity of individual soils, and the above recommendations merely serve as a guide. Poor soils and inadequate dressings of fertilizer will never produce profitable potato crops.

Seed.

Equally as important as adequate fertilizing is the use of good healthy seed. It does not pay to buy seed potatoes from unknown

sources or such seed which has cheapness as its only recommendation. Government-certified seed is obtainable at reasonable prices from the various Seed-Potato Growers' Associations in this country. Special care should be taken not to plant seed potatoes infested with eel-worm, as this is one of the worst potato pests in the Union.

In areas with a reliable rainfall at planting time, 1½ to 3 oz. seed can be used with success. Whereas in drier parts 3 to 5 oz. sets are more reliable. Where suitable moisture conditions at planting time are experienced, cut seed may be used. In this case large tubers are cut into blocky pieces weighing not less than 2 oz and containing not less than two strong, well developed eyes. In order to produce rapid healing of the cut surfaces, the pieces may be dipped into dry lime (agricultural, slaked, or ground quick-lime) or into wood ash, but, if the pieces are planted immediately after cutting, this is not absolutely necessary. If cut well ahead of planting, the pieces should be spread out in thin layers in a suitable shady place where the surfaces can dry, otherwise there will be heating and rotting.

Planting.

In some areas, and particluarly on lighter soils, potatoes are ploughed in. If the rows are to be about 3 feet apart a suitable double-furrow plough is used in conjunction with a single-furrow plough. The tubers are planted in the second furrow made by the double-furrow plough after the fertilizer has been spread and the covering is done by the single-furrow plough. Here also the tubers should be placed to the side of the furrow to avoid damage during covering. Manure in this case is best applied broadcast before the first ploughing of the land, unless plenty of labour is available when it may also be spread in the furrows. Instead of a double- and single-furrow plough, a suitable 3-furrow plough can be used. It is claimed by some that this method of planting is cheaper and gives a better covering to the tubers than the furrow method.

In general, a width of 3 ft. between rows and a distance of approximately 18 in. between the tubers is advocated for a main crop, i.e. one grown mainly for table potatoes. Where a large percentage of seed-size tubers is aimed at, the crop is sometimes planted 2 ft. 6 in. by 9 in. to 12 in., but this practice is not recommended, as close spacing does not necessarily produce small tubers, and for ease of cultivation wider rows are preferable.

The depth at which potatoes should be planted will depend on the soil type. On light to medium soils 4 in. to 5 in. will be found adequate, whereas heavier types—if such are used—necessitate shallower planting, i.e. in the vicinity of 3 in. to 4 in.

Cultivation.

Thorough and judicious cultivation will contribute much towards higher yields. Before the plants reach the surface, one or two harrowings with a light zig-zag harrow, fitted with long and sharp teeth, will assist greatly in the eradication of weed seedlings. These harrowings are best given after the tubers have rooted, but before the shoots are so near the surface that they suffer damage or are exposed too much.

Where, in the furrow method, the covering of the seed is done by splitting the ridges, this harrowing is essential in order to level the land for further cultivation, unless special implements are available. Even after the plants have developed leaves, the crop can be harrowed across the rows, without appreciable damage, for the purpose of cheaply destroying weeds growing between the plants, but this

operation should be carried out with care and not be done on dry, powdery soils, and should also be confined to the very young stage of growth. When the plants are several inches high, cultivation with suitable row cultivators should commence with the object of keeping the soil loose and destroying weeds. This cultivation can be fairly deep and close to the plants while they are young, but should become shallower and carried out further away from the plants as these advance in growth, otherwise damage will result. The number of cultivations will depend on weed growth and the physical condition of the soil. As soon as the plants show signs of spreading, and injury from further cultivation is likely, the potato crop should be earthed up and left alone until the plants start to die down. At that stage a second earthing up should be given. The object of the first ridging is to throw up sufficient loose soil to allow the tubers to develop without growing out of the soil as a result of which they become exposed to greening, weathering, and tuber-moth attack. The second ridging aims at covering up any potatoes which may have become exposed. Further protection against tuber-moth, and, in high rainfall areas, is adequate drainage. Potatoes in these areas are often watery and therefore command lower prices than dry or floury tubers. This wateriness is due largely to the potatoes standing in a soil saturated with moisture. A deep second ridging, with the bottom of the furrow below the tuber bed, ensures the drainage necessary for the potatoes to dry off.

Lifting.

In order to exploit a particularly favourable market, potatoes are sometimes lifted before they are mature. It should be realised, however, that by doing so yield is sacrificed and the keeping quality detrimentally affected. The skins have not set properly on such prematurely dug potatoes and they are therefore very liable to bruising and rotting. Only if such tubers can be marketed immediately, and the distance from farm to market is short, can the premature lifting of the crop be carried out successfully. As a rule, potatoes are left in the ground until mature, and on well-drained soils sometimes considerably beyond that stage. Excessively long storage, however, often leads to premature sprouting and glassiness which affects the market value of the tubers, particularly for the table market. It also brings with it the risk of serious damage from millipedes and the larvae of the dung beetle.

Where a field is badly infested with water-grass, and the crop planted early, serious damage is often caused through the water-grass growing into the potatoes.

Lifting of the crop is generally done with a ridging plough, although hand lifting is often practised where labour is cheap and plentiful. Special potato diggers are also in use. In no circumstances should potatoes be lifted in damp or wet weather, especially if the soil is saturated. This applies even in the case of a mature crop. Bright, sunny weather is the most suitable for potato lifting, when it is possible to allow the tubers to dry off after they are out of the ground and before they are sent to market or carted to storage. This procedure will prevent rotting. On the other hand, excessively long exposure to sun is also harmful, as it will result in sun-scald and subsequent rotting. A short exposure to sun after digging also helps to firm the skin and so improves the keeping quality.

For successful marketing, it is necessary to grade the crop according to recognised grades, and to eliminate all bruised and diseased tubers.

Diseases.

In view of the rapid spreading of potato diseases like virus, early and late blight, bacterial wilt, etc., from field to field, it is a definite safeguard to keep different plantings well apart from each other. It is good practice to have breaks of some tall-growing crop like maize between the various fields as this will to a certain extent assist in minimising the spread of disease.

For further information on potato production farmers are advised to write to the Colleges of Agriculture in their respective areas, or to the Director of Animal and Crop Production, Prudential House, Pretoria.

Useful Hints for Poultrymen.

Sacking makes servicable walls for poultry houses. Old grain bags are cut open along the seams and nailed tightly on to the outside framework, with clout nails, and the joints neatly sewn together. When complete, the sacking is thoroughly soaked with water and the following mixture applied with a brush, giving one coat on the inside and two or more on the outside.

Mixture: Water $1\frac{1}{4}$ gallons; cement 12 lb.; lime 2 lb.; salt 1 lb.; alum $\frac{1}{2}$ lb. Sieve the lime and salt to break up lumps, add the water then the cement, stirring while adding, add the alum last. Select a dry, cloudy day for the application of the mixture. The second and subsequent coats must be applied when the former is wind-dry. It is known that such houses have given good service for a number of years. This material is also satisfactory when used on pitched roofs.

Preventing draughts in fowl-houses.—One of the chief causes of colds and roup in poultry is a draughty fowl-house. The roof should fit closely on the side walls. An opening of 3 to 4 inches must be left between the whole length of the back wall and the roof. To prevent side draughts in a long house, there should be a solid division every 25 feet from back to front, fitting the roof closely. Of great importance is the provision of ventilation below the perches, at intervals of 5 to 6 feet, an air-brick or similar substitute should be placed in the back wall, 6 inches from the floor. Outside a baffle plate (a piece of wood or flat iron) is placed over the air-brick, leaning against the wall, 6 inches above the top of the air-brick, projecting 6 inches on either side and resting on the ground 6 inches from the wall.

Treating wounds on chickens.—When chickens start picking each other, the cause must be traced and remedied. In the meantime the wounds may be dressed with the following mixture: 1 teacup of sump oil, and 1 level desertspoon of powered aloe. The mixture must be stirred well each time before it is used.

[E. F. Lombard, Professional Officer (Poultry), East London.]

Preparation of Compost by the Kraal Method.

K. E. W. Penzhorn, Co-ordinating Regional Officer (Food Control).

THERE is no longer any doubt that the farming community of South Africa and, to a certain extent also the town dwellers, have become "compost minded" during the past few years. This interest has resulted in articles in the press, enquiries from the Department of Agriculture and Forestry and real efforts to make compost.

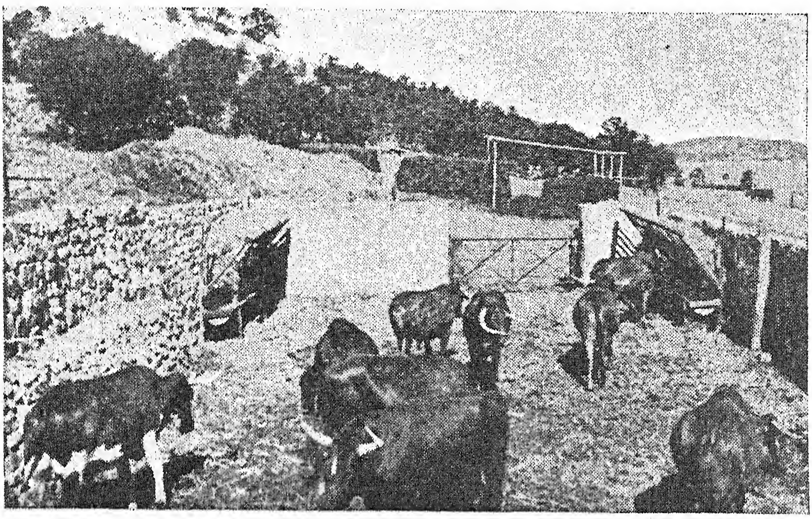

Fig. 1.—Hay is fed to oxen and the residual material converted into compost. [*Photo C. J. van Rensburg.*

It is an indisputable fact that compost made of kraal manure is absolutely essential for maintaining the fertility of soils under irrigation. The method of making compost for this purpose is described elsewhere.

There is still considerable difference of opinion concerning the advantages attached to the use of compost for the production of crops under dry-land conditions in South Africa.

An argument against the use of compost is the results obtained in fertilizer tests with maize in the lower-rainfall areas of this country. According to these tests the applicaion of compost to maize brings about no greater increase of production than is obtained by applying fertilizer alone.

Why Compost is Necessary.

It can be emphatically stated, however, that it is an excellent policy for any farmer in the relatively high-rainfall areas of this country to conserve all the animal manure on his farm to the best of his ability and to convert all waste plant matter on his farm into compost, wherever it is practically possible, for enriching his soil. This is essential for the permanent peservation of soil fertility. It has repeatedly been proved that such crops as potatoes, root crops and artificial pastures, greatly benefit from applications of compost.

Apart from the excellent effect which compost has on the physical structure of the soil and on the bacteriological life in the soil, it also supplies a certain amount of plant nutrients such as nitrogen, potash and phosphate. This is an important factor, since fertilizer is now rationed, while there is at the same time a demand for increased production. The Controller of Food Supplies, therefore, makes an appeal to all farmers to avoid any waste of kraal manure and plant material which can be made into good compost, thus making it possible to increase production or at any rate to keep it at its present level in spite of a shortage of fertilizer.

Requirements for Good Compost.

There are various effective and well-known methods of making compost. The method to be followed will naturally depend on local conditions. The following important requirements are essential, however, for the conversion of plant material into compost, viz.,

(*a*) sufficient moisture must be present; (*b*) good ventilation must be provided since the bacteria require air in order to function properly; (*c*) the bacteria must be provided with readily accessible nutrients; and (*d*) a neutral or sweet medium must be created.

Available moisture for making compost is nearly always the limiting factor in the dry areas of South Africa. Special steps should, therefore, be taken in these areas to provide moisture as already described.

The Kraal Method.

A very simple method of making compost, viz., *the Kraal method*, can be recommended for areas with a relatively high rainfall and where most of the farmers possess a fair number of livestock. It requires a minimum amount of labour and fits in with the relatively extensive nature of farming that is generally practised in these areas. The areas for which this method should be specially suitable are the eastern Transvaal highveld and lowveld, the eastern and central Orange Free State, Natal and large portions of the Cape Province.

This method can be briefly described as follows: all vegetable waste on the farm such as wheat straw, maize stalks and leaves, useless silage and hay, old grass specially cut for the purpose, weeds, etc., should always be carted into the kraal and spread in layers.

It is always desirable to begin with a layer of vegetable waste approximately 1½ to 2 feet thick, every time the kraal has been emptied.

This material will absorb a large proportion of the urine, thus preventing the loss of valuable plant nutrients. The vegetable matter is thoroughly mixed with the animal manure and this is continually supplemented by the addition of new material. Rainwater and urine supply the necessary moisture and manure and urine the necessary food for the bacteria. The process of decomposition will be encouraged by the addition of small quantities of agricultural lime and superphosphate. The superphosphate will not be lost but will increase the phosphate content of the compost.

Most farmers prefer to apply kraal manure to their lands only once a year, viz., during spring. If the amount of vegetable matter available on the farm is small in proportion to the number of stock available, it would perhaps be undesirable and also unnecessary to remove the kraal compost during the course of the year or to turn it in order to accelerate the process of decomposition. In such cases, the kraal need be emptied only when the manure is carted on to the lands.

Ventilation.

If large quantities of plant material are available and the process of decomposition must be accelerated, the partially decomposed compost can be removed from the kraal at intervals of a few months (i.e., as soon as the material has been thoroughly mixed with the manure and urine) and stacked outside the kraal in heaps not more than 9 feet wide and 5 feet high for further decomposition. This handling will naturally improve aeration of the material.

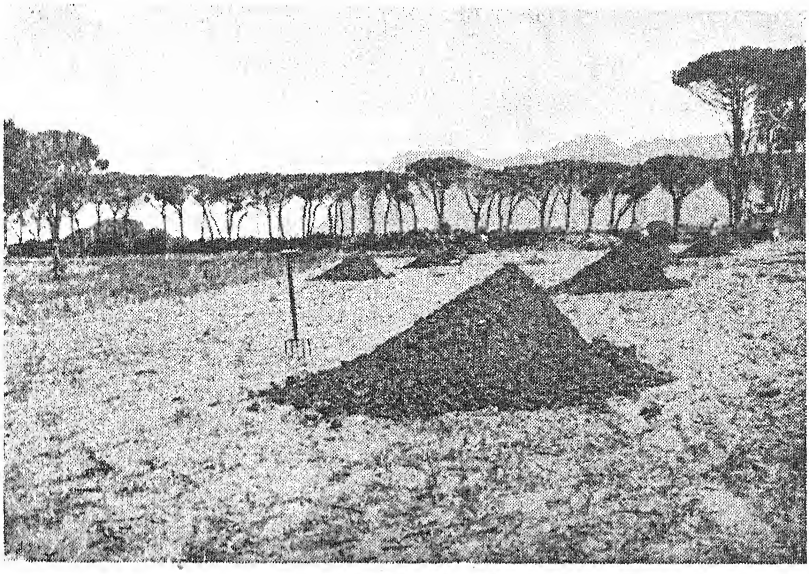

Fig. 2.—Heaps of compost ready for spreading on the lands.
[*Photo C. J. van Rensburg.*

The process of decomposition will be further speeded up if the material in the heaps is turned over, but the extra cost attached to this usually not justified, especially since time is of no importance.

In order to prevent rapid desiccation by dry winds the compost, when taken from the kraal, is often placed in special holes, about 18 inches deep. These holes should be wider at the top than at the bottom in order to enable air to penetrate to the bottom.

The following methods can be used to facilitate aeration:—dig trenches about 1 foot wide and 1 foot deep, place branches across to prevent the material from falling in and stack the compost over the trenches in such a way that the furrows extend beyond the edges of the heap.

At the Estcourt Experiment Station a platform of loose poles was erected approximately 1 foot above the ground and the material stacked on top of that. The extra ventilation greatly accelerated the process of decomposition.

Ploughing the Compost into the Soil.

As soon as the compost or kraal compost is ready it should be carted straight from the heaps or the kraal on to the lands and immediately scattered and ploughed in. Any delay between scattering and ploughing in will result in loss of valuable nitrogen and organic material.

[*Continued on page 635.*

Conversion of Refuse into Soil Fertility.

(Dr. J. P. van Zyl, Chief, Division of Chemical Services.)

IN view of the important role played by compost under present conditions in maintaining soil fertility, steps are being taken at present to make compost available on an extensive scale for agricultural purposes.

In the past, farmers had a large number of different fertilizers available for improving the production capacity of their soil. Owing to the difficulties which are now being experienced in connection with importation, the resultant shortage of fertilizers has now compelled farmers to make use of substitutes. Extensive use was made of kraal and Karoo manure, but the supplies of these are not unlimited. Furthermore, the transportation of these bulky substances over long distances involves serious difficulties. This combination of circumstances clearly stresses more than ever before, the importance of compost in maintaining soil fertility. By making or using compost made by himself, the producer can utilize his limited supplies of kraal manure and fertilizers to better effect in maintaining his production of essential foodstuffs and also the productivity of his soil at the desired level.

Well prepared compost may be considered equal to natural fertilizers. What is more, when it is supplemented with phosphates it is undoubtedly of the greatest value for the cultivation of vegetables, potatoes and other crops which require large quantities of organic material. Under irrigation, especially, the application of compost is of paramount importance in keeping the soil structure in good physical condition.

The Department of Agriculture and Forestry has made every effort to encourage the making of compost, and producers on whose farms demonstration experiments have been carried out are convinced of the possibilities of compost making. It has now become imperative, however, that these operations should be undertaken on a very much larger and more comprehensive scale so as to utilize all waste material to the greatest possible extent for the maintenance of soil fertility. Consequently, the fact is taken into account in this scheme that large quantities of waste material and night-soil which can be converted into compost, thereby making good the fertility sacrificed in the production process, are constantly available in our cities and villages to which practically all our farm products are sent.

Division of Union into Areas.

The scheme, therefore, makes provision for the conversion into compost of municipal refuse, as well as the refuse from military camps. This work will be carried out under the guidance of Mr. J. P. van Vuren who achieved such great success with the making of municipal compost in Ficksburg. For this purpose the Union has been divided into 6 areas: In the Transvaal Mr. U Schmidt, of the Division of Chemical Services, is responsible for the northern Transvaal, and Dr. N. J. Viljoen, of the Potchefstroom College of Agriculture, for the southern portion. Mr. L. Eksteen, of Glen, is responsible for the Orange Free State; Mr. J. G. Bevis, of Cedara, for Natal; Mr. H. Stead for the area served by the Grootfontein College of Agriculture, and Mr. I. Perold, of the Stellenbosch-Elsenburg College of Agriculture, for the western Cape Province. The various colleges of agriculture will make contact with municipalities in their

particular areas, furnish the necessary advice and inspect the work. During the past week these officers met at Ficksburg and there inspected the municipal compost-making undertaking which was discussed in all its phases. In the near future they will organize their whole plan of campaign. In the meantime an urgent appeal is made to all municipal authorities in this country to give serious consideration to this method of disposing of refuse and night-soil whereby waste products will be converted into valuable fertilizers.

Compost Making on Farms.

Another part of the scheme makes provision for the making of compost by farmers themselves. For this purpose, field officers of the Department of Agriculture and Forestry will be made available and a co-ordinating officer appointed so that farmers will be able to tackle the making of compost in a vigorous manner. Our fertilizer position makes it essential for every farmer to pay serious attention to the making of compost. Information with regard to the value and methods of compost-making is obtainable from colleges of agriculture and extension officers, as well as from the Division of Chemical Services.

This scheme will involve new experimental work which is to be undertaken by the Department. In addition, investigations are being carried out at present in connection with the actual cost of the various methods as influenced by the different raw materials used and the different conditions under which the compost is made.

Preparation of Compost by the Kraal Method.—

[*Continued from page 633.*

Removing the compost from the kraal entails a considerable amount of labour. An ordinary dam scraper can unfortunately not be used for this purpose since it will not scoop up the material.

In the May, 1941, issue of *Farming in South Africa* a description is given of how to utilize dam scrapers by attaching iron prongs to the scraper. (Reprints of this article are obtainable from the Editor of Publications, Department of Agriculture and Forestry, Pretoria, viz., Reprint No. 59, 1941.)

Veld Grass.

Large quantities of compost have already been made by practical farmers in this way. At the Estcourt Pasture Research Station, for example, the surplus grass on the veld is not burnt but cut and carted at regular intervals into the kraals where the animals receive their hay, silage, etc., during winter. When summer grazing becomes available the animals are not kept in kraals and then the material is worked into heaps or onto platforms to decompose and left there until such time as it can be carted to the lands.

The writer also knows many farmers who annually thresh their wheat straw into the kraals. The animals consume a large proportion of this straw during the night and the rest is trampled and converted into compost. If threshing takes place during December, the compost is usually ready for use by the following September or October.

According to the experience of one farmer who annually reaps approximately 200 bags of wheat and who dumps the straw in his kraal, he produces yearly between 25 and 30 large loads (approximately 75 to 100 tons) of good quality kraal-compost with 10 to 12 cows which are kraaled at night. No handling is required except to spread the straw in layers occassionally and to cart the compost to the lands.

Protein-rich Feeds in Stock Rations.

Dr. A. I. Malan, Nutrition Committee, Food Control.

PROTEINS are absolutely essential in all rations for animals, and the quantities required by animals depend solely upon the purpose for which they are kept.

Since milk is a product with a high protein content, high-producing cows require a large quantity of protein in their feed. Young growing animals such as pigs or chicks which must be fed, also require a high percentage of proteins since they must produce meat or form new tissue which also have a high protein content. The rations for a full-grown horse which is being fed to enable it to perform hard work, or for a full-grown ox which is being fattened for the market, must also contain some proteins, but very much less than rations for dairy cows, pigs or chicks. Proteins should therefore be regarded as an extremely important nutrient in the feed of all farm animals.

Shortage of Protein-rich Reserve Feeds.

In South Africa the protein-rich feeds which we have at our disposal are not adequate for our requirements. Before the war this shortage could easily be supplemented by importing such protein feeds from countries which produced more than was necessary for their own requirements. In this way for instance, we imported meat meal and bonemeal, fish meal, and oil-cake meal, etc., but this is no longer possible owing to the limited shipping space available. Consequently we should immediately set about supplementing the deficiency in protein-rich feeds in our own country.

To-day the position is such that we are able to produce only approximately one quarter of the protein-rich concentrates which we require. We could use much larger quantities of carcase meal and fish meal than are manufactured here, and prospects for supplementing these products by importing them from adjoining territories are poor since no country really has any surplus for export.

Importation of Oil Seeds.

Although we do not produce nearly enough oil-containing seeds such as groundnuts, soybeans, etc., for our own needs, comparatively large quantities of these seeds are imported and their oil expressed here. The residue has a high protein content and all of it is used as stock feed in the form of protein-rich cakes. This is by far the most important source of our protein-rich feeds and satisfies approximately 50 per cent. of our requirements.

Even with the carcase meal and fish meal produced in this country, and the oil cake meal obtained from the oil expressors after extraction of the oil from seeds practically all of which have been imported, there still remains a serious shortage of protein-rich concentrates which must be made good in some way or other in order to maintain the production of milk, butter, eggs, meat, etc. The problem to be solved, is how best to obtain these protein feeds. It should, moreover, be borne in mind that the shortage of these products would be considerably aggravated if world events were to render unsafe the sea routes to India, from which country most of our oil-containing seeds are obtained.

It is clear, therefore (1) that there is already a shortage of protein-rich concentrates; (2) that the shortage may become much more acute if the war were to interfere with the importation of

 [Continued on page 656.

The Cultivation of Kaffir Corn.

F. X. Laubscher, Research Officer, College of Agriculture, Potchefstroom.

KAFFIR CORN must definitely be included in the series of dependable crops cultivated for the increase of food supplies. This crop is heat and drought resistant and will yield a better crop than maize on poorer soil but is sensitive to low temperatures. Each of the different varieties is more or less strictly adapted to a particular cultivation area.

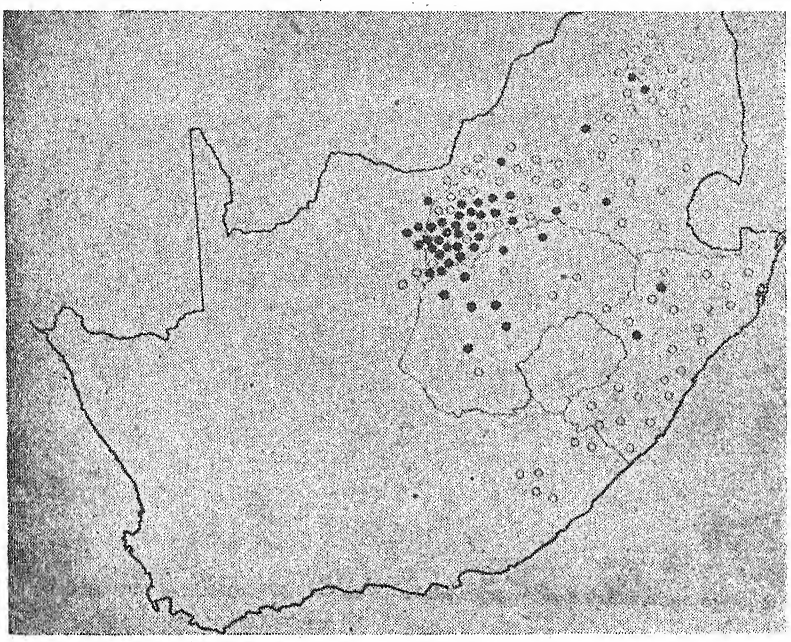

Fig. 1.—Areas in the Union where kaffircorn is produced. Each circle represents a yield of 10,000 bags. The black dots indicate production by Europeans.

Varieties and Areas.

Although the crop is grown throughout the summer-rainfall area, it has been found that each climatic area favours the cultivation of an adapted type which would almost invariably be unsuitable elsewhere. This adaptation is so highly specialized that (even in a normal season) certain Natal varieties scarcely attain the flowering stage when grown in the Western Transvaal. The plant is indigenous and its varieties numerous, one or more having in time become localised in particular areas through adaptation. This is the main reason why there are practically no specific varieties generally recognised by the seed-trade.

The varieties cultivated in Natal are too late for the rest of the Union. The eastern highveld, for example, requires rapidly maturing types which are resistant to the comparatively lower night temperatures.

Varieties cultivated in the eastern Free State satisfy these requirements and would do well on the highveld of the Transvaal, but their yields are not satisfactory in warmer areas further to the west. The Northern Transvaal varieties (Pietersburg, Zoutpansberg)

are also late and cannot be cultivated outside that area. The Western Transvaal varieties have a growing period of medium length and may be safely cultivated only further to the west and north. Summarizing, it may be said that varieties may be moved from the Drakensberg from east to west and from south to north. This should be remembered when farmers run short of seed and cannot procure any in their immediate neighbourhood.

Of the 1 to 1½ million bags of kaffir corn produced annually in the Union, only about one third is produced by Europeans, and although production has been considerably increased in the more easterly areas of the highveld during the past few years, fully seventy-five per cent. of the European crop is normally derived from the Western Transvaal and surrounding areas.

Although suitable varieties of kaffir corn will, therefore, thrive in all parts of the summer-rainfall area, European farmers, nevertheless, cultivate it chiefly in those areas where the cultivation of maize is more precarious.

This then should be the determining factor in deciding whether to plant kaffir corn or not. *When an area is unfavourable for maize on account of its low rainfall and high temperatures, the cultivation of kaffir corn as an alternative crop must be considered.* This will be the case chiefly in the far western areas of the summer-rainfall agricultural area and in the Northern Transvaal. Not only is the climate in these parts unsuitable for maize, but the soils are poor and adequate fertilizing for maize too risky on account of the uncertain and low yields obtained.

Cultivation of the Soil.

Because of its spreading root system Kaffir corn does well on comparatively new soil, and is therefore very often planted in newly-broken soil. It is, moreover, the best crop to plant on lands which have been ploughed during the dry winter for the eradication of quick grass and which consequently contain much organic matter in the form of decayed roots during the following summer. This does not mean, however, that kaffir corn will thrive on weed-infested lands, or on the lands which have been overrun with quick grass. Many farmers are under the erroneous impression that kaffir corn is more resistant than maize to weeds because of its hardiness and its strong root system. This is definitely not the case. Young kaffir corn plants are far more sensitive and tender than those of maize and their developement much slower in the early stages. Consequently kaffir corn actually has fewer chances of success than maize when planted on weed-infested lands. Soil intended for kaffircorn should, therefore, be cleaned beforehand by destroying one or more weed crops with a tined harrow or a rotary spike-tooth cultivator. In other respects cultivation is the same as for maize.

Planting Time.

Crop failures in the case of kaffir corn are frequently due not only to ineffective control of weeds, especially at the beginning, but also to the fact that the crop is generally planted too early.

In this way farmers hope not only to complete the planting of kaffir corn before turning their attention to maize but also to be able in normal seasons to harvest their kaffir corn in time for the good early market.

In the case of kaffir corn planted abnormally, early germination is very poor, sometimes as low as 5 to 10 per cent. of all the seed planted. In addition, the young plants which develop very

slowly, are often destroyed by ground beetles or drift sand, or choked by weeds and severely attacked by stalk borers.

The grains are formed before the seed of grasses is ripe, with the result that they are particularly subject to damage by birds. The short red kaffir corn of the Western Transvaal may safely be planted up to the beginning of December though the best time is during November.

The most effective rate of seeding is that which will eventually yield a spacing of 3 feet by $1\frac{1}{2}$ feet, for which 4 to 6 lb. of seed per morgen are required under good conditions, but more if the seed

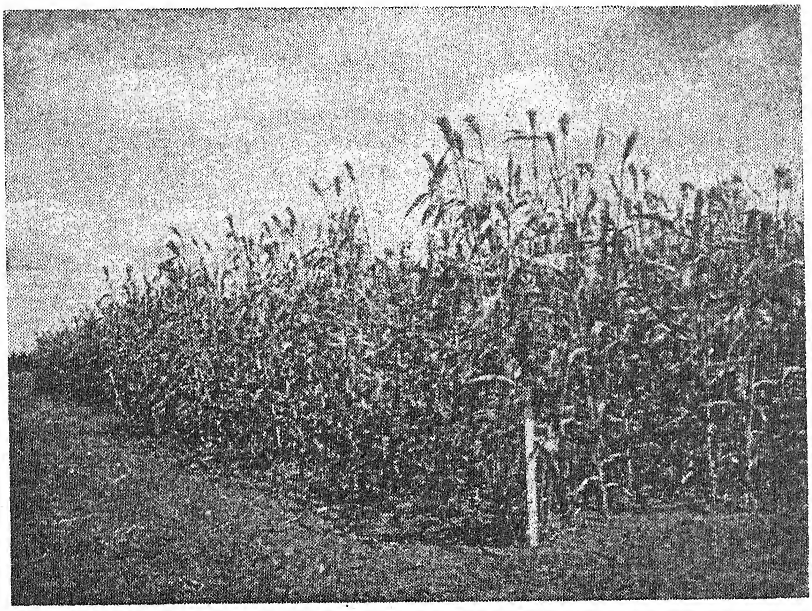

Fig. 2.—A patch of sweet sorghum at the College of Agriculture, Potchefstroom, which yielded more than 40 tons of green material per morgen.

[*Photo Dr. Saunders.*

is poor or conditions for germination unfavourable. The seed should be treated against smut with Ceresan or Agrosan.

This treatment also encourages germination.

Birds, Lice and Witchweed.

These three are the chief enemies of the kaffir corn farmer, and, in addition, difficult to control. It has already been pointed out that birds are more troublesome when planting has been untimely. Damage by birds is most serious during the milk and early dough stages of the grain, at which time they easily break the grains and peck out the contents. When farmers control birds by scaring them, this activity should be commenced as soon as the plants are well in flower. Bitter-seeded or so-called " birdproof " varieties should not be cultivated, since they are unfit for human consumption, and will probably experience severe adverse trade discrimination later on.

A heavy shower of rain and movement of the plants caused by wind are very effective in reducing lice infestation. In dry years

[*Continued on page* 682.

The Proper Use of Manure.

THE crops which will derive the greatest benefit from the application of *large quantities* of organic fertilizer are flowers, vegetables, potatoes, fruit and vines. In these cases the fertilizer (compost, stable manure, kraal manure, Karroo manure, bird manure, etc.) need not be ground or sifted before being used, but may be applied in the natural state. Large lumps should, however, be broken up somewhat before the manure is spread and ploughed under. Since the ratio of phosphate to nitrogen in all these fertilizer varieties is too low for conditions prevailing in this country, the best results can be expected only if the natural manure is supplemented with superphosphate or something similar. Since difficulty will be experienced in thoroughly mixing several hundred pounds of superphosphate with several tons of manure, it will generally be more practicable to apply the superphosphate separately, although with good supervision it is not impossble to apply the superphosphate together with the manure. Less than two tons per morgen is seldom applied, the usual amount being 10 or 20 tons or even more. Strong fertilizers such as Karroo manure, fowl manure and guano should be applied more sparingly. Ground manure is much too expensive for this purpose.

During the past few years it has become customary for sellers of Karroo manure to grind and sift the manure, thereby supplying a commodity which they recommend for application by means of the fertilizer attachment of a planter. Municipal compost is also being offered in this fine form, and the same applies to certain other natural fertilizers. This fine manure is then recommended by sellers for application in small quantities to wheat, maize and various other crops. On the whole, however, the Department cannot recommend this practice. It is true that many farmers are strongly in favour of using Karroo manure in this way. Unfortunately, however, the farmer is not in a position to deduce from his practical observations whether this method actually was profitable. It is known that sometimes the external appearance of young wheat or maize which has received a few bags of fine manure, is better than that of plants which received either no fertilizer at all or superphosphate only. It is extremely doubtfull, however, whether the yield will show any improvement. According to the few dependable experiments that have so far been carried out by the Department, it may be said that the application of quantities of 2, 3 or 4 bags of manure per morgen has no effect on the grain yield. The Department, however, does not wish to go so far as to state definitely that small quantities applied by means of a planter cannot at times have a beneficial effect. Farmers who are of opinion, therefore, that it is to their advantage to follow this practice, may as well continue with it in the future. Favourable results may be expected, however, when a mixture consisting of one bag of superphosphate to every 3 or 4 bags of fine manure or compost is used and the fertilizer attachment is set to its maximum width to give an application of 600 to 800 lb. of the mixture per morgen.)

Sellers sometimes give farmers the impression that natural manure can be substituted for superphosphate. This is entirely erroneous. In regard to the necessary phosphatic nutrients, one ton of manure per morgen is the equivalent of only 60 lb. of superphosphate. The manure, moreover, provides the soil with considerably more nitrogen and phosphates; consequently, in order to prevent the plants from suffering under an excess of nitrogen, as well as to make profitable use of this valuable nitrogen, the manure should be supplemented with superphosphate. (*Division of Chemical Services.*)

Weed Control.

Dr. A. R. Saunders, Deputy-Director of Production.

ONE of the greatest difficulties the crop farmer in the summer rainfall area has to contend with is drought, and it is essential that only those practices shall be employed which reduce crop failures through lack of moisture to an absolute minimum. A policy of expecting the worst and preparing for it in due time, will in the end prove the most economical, for high yields in good seasons and crop failures in relatively poor ones constitute a serious weakness in our whole agricultural system. Fair average returns are not enough if there is an unduly wide fluctuation between the highest and the lowest yields, and the main object should be consistency and stability of production in so far as climatic conditions permit.

In proportion to the total amount of vegetable matter they produce, weeds generally take up more water from the soil than maize or other crops. Furthermore, the moisture transpired from a given area of leaf surface, whether of weeds or agricultural crops, is invariably much greater than that lost by evaporation from a corresponding surface of soil. The argument that weeds help to conserve moisture by shading the soil against the direct rays of the sun is therefore fallacious in the extreme.

Methods of Control.

The first operation in weed control is winter-ploughing. Except on light sandy soils which are subject to wind erosion, the overwhelming weight of evidence is in favour of thorough ploughing of the soil to a depth of 7-9 inches as soon as possible after the onset of frosts. This will in itself cause the destruction, in part, of underground runners or rhizomes of "kweek" and of a portion of the "nuts" or corms of the troublesome watergrass or "uintjie". But even if all the lands cannot be ploughed in winter much can be done after a spring or summer ploughing by applying the right methods of cultivation before and after crops are sown or planted.

Depending somewhat upon the type of soil, most weed seeds will germinate only in the upper layer of 3 to 4 inches in depth. Upon this fact is based one of the most economical practices of weed control, viz., that of pre-cleaning. This consists in destroying one or more crops of weed seedlings by means of a disc harrow or other suitable implement *without turning over the soil and thus bringing a fresh crop of weed seeds to the surface.* The operation has the added advantage that it brings the soil into good tilth. An essential requirement is that it be carried out before the weed seedlings are well established, preferably even before they have appeared above ground, for at that stage they are tender and easily killed by exposure to the sun or to desiccation. If possible at least two cultivations, with an interval of a week or 10 days between them, should be given prior to planting if the soil is moist.

Cultivation after planting needs no discussion, beyond stating that a common fault in this regard is to delay operations until the weeds are too far advanced. The use of the harrow four days after planting will not injure germinating maize or other crop seeds, but will go a long way towards reducing the weed population and is a cultural operation which should on no account be omitted if conditions are at all favourable.

Cultivation.

The best type of cultivator to use for inter-row cultivation is a question for the farmer himself to decide, but here too timeliness is a primary consideration. If weeds are well rooted and wet weather follows immediately after cultivation, a large percentage of them will re-establish themselves immediately, with the result that by the time the soil is dry enough to be worked again, the growth is too far developed for the ordinary cultivator to do efficient work. On the issue of flat cultivation *versus* ridging the deciding factor is effectiveness of weed control, but if a ridger is used, the work should proceed progressively. Deep ridging when the maize is full grown and following upon harrowing or flat cultivation may have disastrous consequences by cutting off a large proportion of the crop roots.

A matter about which there is a good deal of controversy and conflicting evidence is that of the soil mulch. The type of soil and the character of the rainfall are factors to be considered, but in the main it can be said without reservation that the value of the mulch, as a means of preserving soil moisture, has in the past been greatly over-rated. In the case of soils which are inclined to form a crust after heavy rain, cultivation to break the crust may facilitate moisture penetration when the next rain falls, but the chief aim of inter-row cultivation should in all cases be the control of weeds.

Special mention deserves to be made of "uintjies" or water-grass, for the spread of this pest is assuming alarming proportions. The weed is propagated by means of true seed as well as by nuts or corms, which are usually borne on underground runners or strings. These are characterized by apical dominance in germination, just as in the case of the eyes of a potato tuber. That is, the nuts at the forward end of the runner will be the first to germinate, the others remaining dormant for the time being and germinating only after the first ones have been destroyed or the connections between the nuts have been severed.

Apart from winter ploughing to expose the nuts thereby brought to the surface to the action of frost, an important initial step in control is therefore to break up the runners into as many separate pieces as possible. This can best be done by putting a disc harrow across the land in both directions with the discs set fairly straight and the implement weighted down. A large percentage of the nuts will then germinate as soon as conditions become favourable. Just when the weeds reach the flowering stage the ground should be ploughed over. At that stage the food reserves in the nuts which have germinated are more or less exhausted and the new nuts are not yet fully formed. The second ploughing should be followed by two or three shallow ploughings or cultivations at three-weekly intervals, before a crop is sown or planted.

Nursery Quarantines.

The following nursery quarantines were in force on 1 September, 1942:—

1. Subkleve's Nurseries, Johannesburg, on deciduous fruit trees (part), for pernicious scale.
2. Page's Nurseries, Franschhoek, on Citrus (all), for red scale.

Fodder Crops.

J. J. du Toit and F. X. Laubscher, College of Agriculture, Potchefstroom.

CLIMATIC conditions in the summer rainfall area are of such a nature that during the winter period the natural pastures are not only of poor quality, but are often indequate for the maintenance of farm animals. The shortage of natural feed is often also accentuated by protracted droughts and the overstocking of farms. The production and storage of fodder crops are therefore of primary

Maize which produced 8 tons of dry material.

importance in most areas for the success of stock farming. This need is perhaps fully realised by most experienced farmers, but the matter is made more complicated by the difficulty of deciding what kinds of crops to grow for the purpose. Not only will the choice of crops depend on the prevailing climatic conditions, but also on the feed requirements of the animals.

Varieties of Fodder for Ruminating Animals.

For the purpose of feeding ruminating animals a variety of at least three or four different kinds of crops should be grown to supplement the natural pasturage, namely, (1) a cereal such as maize for a concentrate; (2) one or other legume as a source of proteins; (3) a succulent crop (particularly for milk producing animals), e.g. green winter grazing crops, root crops, spineless cactus, silage crops, pumpkins, cattle melons, saltbush, etc.; and (4) grass-hay crops as a source of roughage, e.g. teff, millets, Sudan grass, ambercane, babala and maize stover.

Hay Crops.

The last-mentioned group of crops is of primary importance to the stock farmer, not only because roughage is the natural food of

ruminating animals and constitutes the greater portion of their daily requirements, but also because hay crops are the cheapest kind of feed to produce and the expenditure on concentrates can be considerably reduced if a large supply of good quality hay is available.

Maize stalks.—Many farmers in the maize area depend on their maize stalks as a source of roughage, but by pasturing these in the field excessive wastage takes place, as a result of tramping by animals and weathering agencies. Moreover, the quality and quantity are of such a nature that only oxen and non-producing animals can subsist on the material for a limited period of time, i.e. at the best up to the end of August. For the critical September, October and the possible subsequent dry period, some other more valuable reserve hay feed should be available.

Teff.—On the highveld of Transvaal, Natal and the O.F.S. where fairly fertile soils and regular rains occur, teff is the outstanding hay crop that can hardly be surpassed by any other hay plant. It is quick growing, so that it an be cut for hay after 6 to 8 weeks, and produces two to four cuttings in a season if sown early. It is easily cured into hay on account of its fine stems and leaves, while the hay is of good quality and most palatable to animals. The crop has certain drawbacks, however, which should not be overlooked. It is a shallow rooted crop and has a very exhaustive effect on the upper soil, especially if grown continuously on the same land. The crop is also limited mainly to light sandy loam soils, as germination of the seed is generally very poor on heavy soils which are inclined to form a hard crust. A further disadvantage is the danger that "uintjies" or water grass is spread from land to land if farmers are not careful that their teff seed is from "uintjie" seed.

Millets.—In the drier areas of the summer rainfall area teff is an uncertain crop, and if grown on poor sandy soils, it is generally a complete failure. In these areas farmers can resort to the more drought-resistant fodder crops, e.g. the sweet sorghums such as ambercane and wintersome, the millets such as babala, Proso, Boer and Japanese barnyard millet and Sudan grass. Ambercane, wintersome and babala have comparatively thick stems, so that they require a long time to cure into hay and for this reason they are generally grown more particularly for ensilage purposes. The following results obtained at the College of Agriculture during the 1940-41 season give some indication of the yielding abilities of the various silage and hay crops:—

Fodder.	Maize.	Babala.	Sunflowers.	Sweet Sorghum.	Sudan.	Proso.	Japanese.	Boer.	Teff.
Green (tons per morgen).	38	48	42	40	—	—	—	—	—
Hay (tons per morgen)	—	—	—	—	4·5	5·3	3·0	7·4	5·1

The sweet sorghums, especially selections from indigenous material, often give very high yields and are particularly suitable for silage purposes. Babala (kaffir manna or 'nyati) has somewhat dry stems, but is nevertheless a good silage crop, especially if mixed with other more succulent crops. The crop is also useful for

supplementary summer grazing purposes, as it is quick growing and can be grazed off several times in its young stages, while there is no danger of prussic acid poisoning as is the case with the sorghums. The crop is also resistant to witchweed.

Sudan grass.—As regards the finer-stemmed hay grasses, a choice can be made between Sudan and three different types of millets. Japanese barnyard millet is a comparatively poor yielder, but it has the advantage that it is quick in growth, so that it can be sown late in the season. The plants also do not lodge very readily. This crop is frequently sown in a mixture with teff to prevent the latter from lodging on fertile soils. An attractive kind of millet in the field is Proso manna (Panicum miliaceum). There are unfortunately several types, some of which are poor yielders. The prosos also rarely produce an aftermath or a second cutting. As regards the foxtail types, ordinary Boer and red manna are two very popular varieties.

Owing to the danger of prussic acid poisoning, Sudan grass frequently does not receive the attention it deserves. The crop withstands drought and heat better, and it is also better adapted to poor soil conditions than most other kinds of hay grasses. Danger of prussic acid poisoning exists only when the plants are still very young. It has been proved that after the plants are about 18 inches high the prussic acid concentration is harmless, and in the form of hay the crop is an excellent feed for animals. If sown early (November), this grass produces two or three cuttings of hay in a season. The crop cannot be strongly recommended in high rainfall areas, however, on account of a leaf-spot disease which reduces yields during some seasons.

Cultural Practices.

In all cases it is advisable to destroy one or two crops of weeds before sowing a hay crop, especially if the seed is to be sown broadcast. The sweet sorghums and babala are generally best planted in rows 30 or 36 inches apart and 12 to 15 inches apart in the rows, so that subsequent cultivation is rendered possible. In this case 4 to 6 lb. of seed will be required per morgen. The finer-stemmed hay grasses are generally sown broadcast (and covered by harrowing) at the following rates per morgen:—Sudan and Foxtail millets 25 lb.; Proso and Japanese 30 lb., and teff 10 lb.

Harvesting.

The coarser-stemmed crops are cut for silage as soon as the seed is well set, while the hay crops are cut when the plants are in full flower. After allowing the hay material to wilt for a day, it is raked into windrows and after a day or two placed in conical-shaped cocks to dry out for a further few days and then carted into a large stack, which is given a proper dome shape to shed rainwater.

Popular Bulletins.

(1) Calf Rearing—Bulletin No. 224. Price 3d. Obtainable from the Editor, Department of Agriculture and Forestry, Pretoria.

(2) The Export of Fresh Grapes from the Union of South Africa during the Ten-year period, 1930-39—Bulletin 225. Price 6d. Obtainable from the Chief, Division of Horticulture, Pretoria.

(3) Soft Cheese as a Food—Bulletin No. 229. Price 3d. Obtainable from the Editor, Department of Agriculture and Forestry, Pretoria.

Care of Grain Bags.

Dr. A. R. Saunders, Deputy Director of Production.

IN the past the wastage of bags has been exceptionally high, and even to-day many thousands of bags are handled so carelessly that they do not last as long as they should.

Economy and care in the use of all classes of bags are matters of extreme urgency, in view of the present scarcity and the difficulties of obtaining supplies from overseas.

It is therefore imperative that the greatest care should be exercised by all users of grain and other bags to prevent unnecessary wastage and in so doing to obtain the fullest and most economical use of the supplies available.

Causes of Wastage.

The following are some of the most important causes of wastage; and users of bags are advised to bring them to the notice of their employees:—

(1) *Slashing open tops instead of carefully cutting the twine with which the bag is sewn.*—Even new bags are often treated in this manner.

(2) *Dragging bags over rough floors or over the ground.*—Nails projecting above flooring boards, sharp edges of cobble stones, rough cement surfaces and stones, or other objects on the surface can be as destructive as wilful slashing. A suitable porter's barrow or some other means of moving the bags without dragging them will soon pay for itself through the saving on bags.

(3) *Insufficient protection against rodents.*—In this case there is ususally a loss of contents as well as bags, and suitable methods of protection are always worth while.

(4) *Exposure to moisture* through lack of proper covering or through storage under leaky roofs.—The fibre of which bags are commonly made readily absorbs moisture and soon rots when wet or damp. Contact with other substances such as oil, grease, tar or creosote should also be prevented.

(5) *Stacking bags direct on cement or other moist surfaces.*—This is a very common cause of damage and one which can be easily prevented by first laying a base of poles, old planks, smooth stones or other suitable objects.

(6) *Carelessness in taking samples.*—All too frequently the grain probe or sampling tube is jabbed into the bag with maximum force, so that the sharp edges of the probe act like a knife in cutting the fibre. No matter how small the hole which is made, the cut edges soon fray and the fabric unravels. Often a knife is used to make a slit, and cases have been brought to light where holes are even kicked into the bag to get at the contents for sampling.

(7) *Trumbling bags from stacks, wagons or lofts.*—This invariably results in a certain percentage of the bags bursting or tearing along the seams. Such bags are usually a complete loss for repair is difficult and costly.

(8) *Over-filling of bags.*—When bags are too full, they are subjected to severe strain in handling or stacking. As much free space as possible should be allowed, specially when the contents are heavy, so that the bag will have a certain amount of pliancy and the forces of stress become more evenly distributed.

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Legumes as Stock Feed.

H. P. D. van Wyk, and W. A. Verbeek, Animal Husbandry Officer, Vaal-Hartz Experiment Station, and E. D. Adler, Lecturer in Animal Husbandry, Glen.

AT certain times of the year, especially during winter, the natural grazing in certain areas is deficient in nutrients. Among the most important, and usually the most expensive, nutrients are proteins which play a vital rôle in the maintenance, growth and production of animals. In many cases where animals are apparently being provided with sufficient feed, it is nevertheless found that their growth and condition are unsatisfactory. Most of these cases are due to a p otein deficiency in the feed. This deficiency can be supplemented in a most effective and economical manner, however, by the utilization of legumes which are rich in protein of high quality.

Proteins are essential for the growth and life of every cell in the animal body. For human nutrition the protein-rich foods such as milk, cheese, meat, eggs, etc., are always more expensive than the carbo-hydrate foods like maize, wheat, potatoes, rice, etc, which are much cheaper per pound of dry material. To-day the demand for protein-rich foodstuffs is greater than ever before, but our farm animals can produce these for us only if they are provided with the necessary quantity of good quality proteins in their rations.

The group of plants known as legumes, which include all types of beans, as for example soybeans, mung beans, cowpeas, sugar beans, tepary beans, haricot beans and groundnuts, as well as crops such as lucerne, the clovers, peas and many others in addition, are all rich in proteins. Table I reflects a few comparative nutrition values.

TABLE I.

Feed.	Dry material.	Digestible proteins.	Total digestible nutrients.
	Per cent.	Per cent.	Per cent.
Teff hay	80·90	4·6	56·6
Cowpea hay	90·3	13·1	49·0
Lucerne hay (before flowering stage)	90·4	11·2	53·2
Lucerne hay (after flowering)	90·4	8·6	44·9
Maize (grain)	87·8	7·7	84·2
Soybeans (seed)	90·2	32·8	86·2
Cowpeas (seed)	88·6	19·7	76·5
Silage (maize)	26·3	1·1	17·7

The amount of digestible proteins contained in good legume hay is three times as great as that in teff. The proteins present in legumes supplement the protein deficiencies in our cereals. Legume hay is exceptionally rich in minerals and of all our ordinary feeds it is richest in calcium. Its phosphorus content is not very high, however, and stock feeders are therefore advised to continue feeding bone meal according to the recognised methods. Legume hay is also rich in the two important vitamins, A and D.

Value of Lucerne.

Although such legumes as lucerne, cowpeas, velvet beans and soybeans all have essentially the same value as roughage, lucerne alone will now be discussed at greater length. In addition to its value

as a protein roughage, this crop possesses the property of increasing the digestibility of other roughages, especially teff.

Under suitable conditions, lucerne yields a large quantity of feed of excellent value which may be used in the following well-known forms for feeding purposes, namely as hay, lucerne meal, silage and as pasturage.

Legume-hay Meal.

Although the hay of all legumes may be ground, the product being an excellent feed, lucerne meal is a well-known form of feed which is used mainly in mixtures for pigs and poultry. Under existing conditions lucerne meal is of still greater importance owing to the fact that it may be used as a substitute for wheaten bran which is now unprocurable. In the consumption of lucerne meal the amount of wastage is much smaller than is the case with lucerne hay, and it is also claimed that in this form it is more digestible, but in normal circumstances the cost involved in grinding lucerne hay would not justify the use of lucerne meal. The danger also exists that the lucerne meal sold by dealers may sometimes have been prepared from inferior hay. Consequently, its nutritive value may vary considerably and it would be difficult for the purchaser to determine its quality as readily as in the case of lucerne hay.

Lucerne Silage.

As has been indicated in the foregoing table, lucerne hay of good quality contains a considerable percentage of digestible crude protein. In addition, a much larger quantity of digestible crude protein per morgen is obtained from lucerne than from many of the other farm fodder crops. There are times, however, as during rainy weather, for example, when lucerne hay of good quality cannot be made. Considerable loss would be suffered if the lucerne could not be conserved in some other form at such times. Not only would ensiling of the lucerne prevent such loss, but the nutrients present in lucerne would be preserved even more effectively than in good quality hay, as is shown by the following figures.

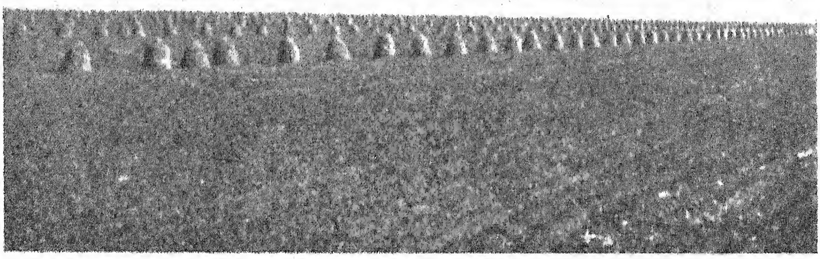
Air-dried basis.	Ash.	Fat.	Crude Protein.	Crude Fibre.	Carbo-hydrates
	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
Green lucerne..............	10·85	1·64	20·84	34·38	32·29
Lucerne silage..............	10·73	2·57	19·69	34·01	33·00

Another advantage of ensiling lucerne is that succulent feed is available during difficult periods, e.g. during winter. Succulent feed is of special importance in the feeding of dairy cows.

Recently the ensiling of legumes and other protein-rich crops has been successfully practised on a considerable scale, but even to-day owing to the fact that many farmers are not yet fully conversant with the method of ensiling such crops, comparatively little use is being made of lucerne silage. During the past three years, large quantities of good quality lucerne silage have been made at the Vaal-Hartz Experiment Station, and in this form has proved very palatable to the farm animals. For the guidance of farmers who are not yet well versed in the method of ensiling lucerne, a short

description of the process as carried out at the Vaal-Hartz Experiment Station is given below.

The lucerne is cut as near as possible to the time when the crop reaches the 10 per cent. flowering stage, i.e. at the same stage as it is cut to the greatest advantage for hay-making purposes. If possible, the lucerne should be cut and carted during the coolest part of the day. Very often, however, practical difficulties make it necessary for the work to be carried on throughout the day, except for an hour or two during the hottest part. In that case it is advisable to arrange mowing operations in such a way that there is no accumulation of cut lucerne



Stooks of Legume Hay.

on the land but that the newly-mown lucerne is placed in the silo at the earliest opportunity.

Lucerne and other protein-rich fodder crops do not contain sufficient starches and sugars for the formation of the quantity of acids necessary for their preservation. Consequently, this deficiency must be supplemented in order to prevent rotting. Excellent results have been obtained with the use of molasses but the same measure of success can be achieved by utilizing other material, as for example, a mixture of green maize and lucerne, mealie meal and certain acids. The material used will depend on what is cheapest under the circumstances.

Where molasses is used, excellent results are obtained by the addition of 3 per cent. molasses, i.e. 60 lb. molasses per ton of green lucerne, the syrup being diluted with 10 gallons of water and then applied. The dilution may be greater if the green material is wilted. In order to ensure the production of good quality silage it is better to use too much than too little molasses during the ensiling process.

The usual precautionary measures are necessary in making lucerne silage, i.e. the mass should be pressed down well to exclude air, and sealed to prevent the entrance of air from above.

Lucerne Grazing.

Many farmers make use of lucerne as a pasture crop for various kinds of farm animals. The advantages of this method of utilization are obvious, since the lucerne is consumed in its natural form whereas in the case of hay or silage there is always a certain loss of nutrients. Grazing the lucerne also eliminates the labour costs involved in making hay or silage. In addition, the manure obtained is spread on the land

in a natural manner. Unfortunately, the grazing of lucerne by cattle and sheep cannot be recommended as a general practice owing to the serious danger of losses as a result of bloating. Various preventives against bloating are used in different parts of the country but no completely satisfacory preventive has as yet been discovered.

Where lucerne is grazed, the danger exists that the stand will be damaged and the life of the plant shortened. It is essential, therefore, that the farmer should exercise discretion in the grazing of lucerne.

The extent to which lucerne is utilized in the above-mentioned forms will depend on the requirements of the different classes of farm animals. Feeding should aim in the first place at meeting their maintenance requirements and only thereafter at the production of milk, meat, wool, etc.

Care of Grain Bags.—

[Continued from page 645.

(9) *Not emptying the bags completely.*—Meal, flour or grain left in bags attracts rodents and is an excellent medium for the development of rot-producing moulds if the bags are damp. All bags should be thoroughly emptied by turning them inside out and shaking off remains of contents before they are put into storage.

(10). *Lack of adequate protection in storing empty bags.*—Bags will attract rodents even when there is no grain or other food substance in them, for all common rodents, and rats in particular, are very partial to the fibre for nesting purposes. As another important cause of loss is rotting through dampness, complete protection of empty bags against rodents and through drying before storing them are absolute essential in the preservation of such bags.

Protection of Bags.

Bags containing chemical substances such as fertilizers or lime soon perish unless the injurious agents are removed. A good practice is to empty all fertilizers, etc. on to cement floors or into brick bins and to wash out the bags thoroughly without delay. Although such bags are generally unsafe for the transportation of grain they can be put to good use in harvesting operations in the field, thereby effecting a considerable saving in grain bags.

To save costs and labour in repairing damaged bags, timeliness should be regarded as a first principle. The longer the delay the more difficult it is to repair bags and the less satisfactory is the result.

Water for Laying Hens.

Water for laying hens.—An egg contains from 70 to 75 per cent. of water and it is therefore obvious that hens in production should have access to a continuous supply of cool, clean, fresh water, otherwise their laying may be affected even to a point of non-production. Should they require Epsomsalts, it is best given in a wetmash, at the rate of 1 lb. per 100 birds. By medicining the drinking water, hens will just drink enough to quench their thirst, which is insufficient for full egg production requirements, resulting in a loss of eggs.

[E. F. Lombard, Professional Officer (Poultry), East London.]

Groundnut Production.

J. Sellschop, Technical Adviser, Groundnuts, Food Control Organization.

THOUGH the Union normally produces all the groundnuts required for human consumption, not more than a small proportion of the needs of a greatly-expanded oil expressing industry is being met by local production. A greater use of groundnuts in the national diet would also prove beneficial to the health of the population.

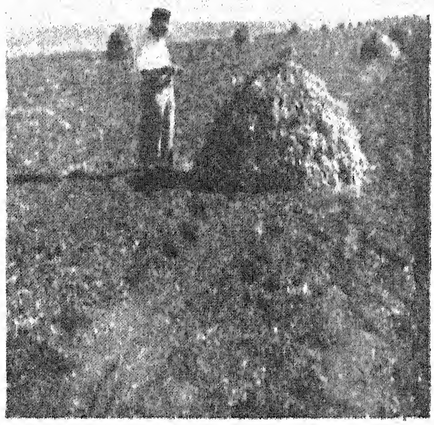


FIG. 1.—A Cock of groundnuts plants. Nuts to the inside.

To produce groundnuts profitably it is necessary to secure high yields per morgen and so lower the cost of production. This can be achieved by selecting land best suited for this crop and by care in production and harvesting. An ample supply of labour or a suitable machine is essential for the picking of the nuts. To effect savings in transportation and in the use of bags, shelling facilities will have to be provided near communities undertaking production on an extensive scale. On account of the high railage rate on unshelled nuts, only the best nuts can be sent to distant markets in this form. Good quality nuts for the edible trade will, however, always meet with a ready demand.

Climatic and Soil Requirements.

For its best development, this crop requires a sub-tropical climate. It cannot be considered a safe crop for large-scale production in the cooler highveld districts, or where the summer rainfall is below 22 inches per annum. Recommended areas are (1) Natal, with the exception of the districts of Impendhe, Ixopo, Richmond, Kranskop, Bulwer, Underberg, Lions River and Babanango; (2) the

Transvaal, except the highveld and the extreme south-western districts, (3) the north-western Orange Free State, and (4) the irrigated areas of the Vaal-Hartz and Orange Rivers.

Light, friable loamy soils which are well supplied with organic matter and contain some lime, are best. Heavier soils produce large yields of nuts, but difficulties in cultivating and lifting the nuts are factors which make them less suitable. Plough and prepare fields as is generally done for maize, special care being taken to cultivate well *before planting to destroy weeds*.

In order to obtain well-planted even stands, it is essential that groundnut seed should be carefully sized and treated with a suitable seed protectant. A mercuric dust is generally used for this purpose. Medium sized seeds break less readily and produce more even stands than very large seeds. Depending upon the size, 60-65 lb. of seed will be required per morgen. Only shelled seed should be planted.

Throughout the recommended areas the most suitable planting time is from the last week in October until he second week in December. In the warmer areas, Rosette, a virus disease, is often troublesome in crops planted before or after this time. In the cooler areas the soil may be still too cold during October to permit rapid germination, and crops planted during the latter part of December may be damaged by frost or may not manure properly. All volunteer groundnut plants should be destroyed before planting.

Planting.

The seed is generally planted with a maize planter fitted with thick, or specially drilled plates, or with other appliances which facilitate the regular and even dropping of unbroken seeds. To overcome the breaking of seed, the tension of the springs under the knockers in the seed bins may be reduced, or the knockers may be replaced by ones cut from an old motor tyre. Where possible, the planters may be set to space the rows 30 inches apart and to allow the seeds to be dropped 5-7 inches apart in the row, at a depth of 2-3½ inches. The seed should be planted in moist soil, and at such a rate of seeding that the mature plants shadow the soil completely.

Groundnuts should not be grown continuously on the same lands but in rotation with leguminous and other well-fertilized crops. On exhausted or naturally poor soils they respond well to applications of 10-12 tons of kraal manure and 300 to 500 lb. superphosphate per morgen. Superphosphate should not be drilled too near the seed, as the latter is easily injured by this fertilizer. Where manure is not available, mixed fertilizers of the C (2:12:2), or D (3:13:3) composition may be used when obtainable. To soils deficient in lime applications of one or two tons of agricultural lime may be made.

In order to reduce hand weeding, light harrows may be run across the rows about three days after planting. If the harrowing is delayed too long, the germinating seeds will be damaged. Thereafter cultivating between rows must be undertaken *as soon as* the plants are well above the ground. When the plants are in flower, soil may be worked towards them with the cultivators, but earthing-up should not be excessive. Groundnuts are usually not subject to eelworm attack.

Harvesting.

Harvesting may commence when the kernels are loose and the shells turn brown on the inside. By this time the plants generally assume a yellowish appearance. When grown in friable soils the plants may be pulled by hand. In heavier soils they should be lifted

with a special groundnut lifter, or be brought out of the soil with a small single furrow plough from which the mould board has been removed. According to the amount of leaves still on the plants when they are to be lifted, or according to prevailing weather conditions, the plants are pulled or lifted, stood upside down, allowed to dry, or packed direct into cocks.

The hay obtained after the removal of the nuts is rich in protein and worthy of careful storage and handling.

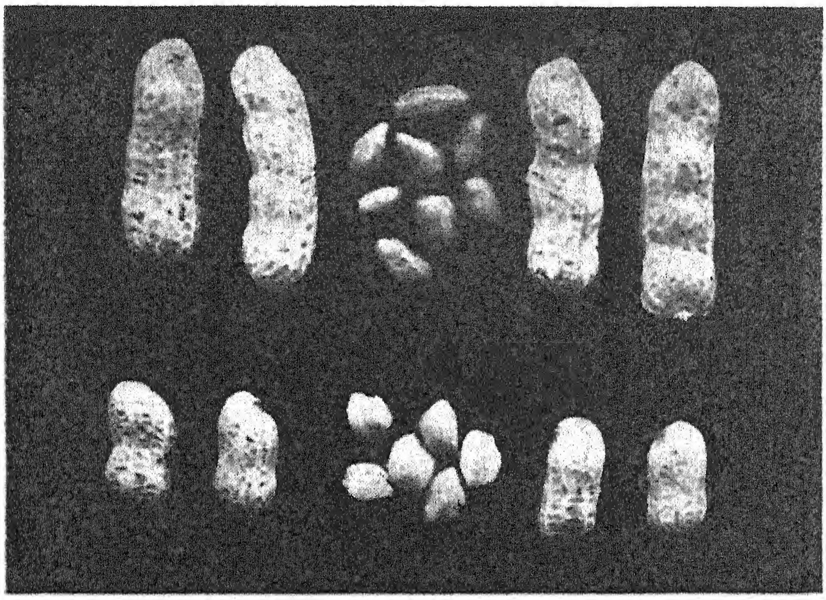


FIG. 2.—*Top.*—Virginia Bunch (Valencia type). *Bottom.*—Natal Common (Spanish Bunch type.)

Yields per morgen vary according to soil and rainfall conditions. Where groundnuts are not grown continuously on the same fields, and care is taken to maintain soil fertility, yields of 15-20 bags of 100 lb. each of unshelled nuts may be obtained. Under adverse conditions and on soils frequently planted to groundnuts, yields of 10-12 bags per morgen are the rule.

Varieties.

The Virginia Bunch is the most extensively grown variety on account of its earliness, size of nut, ease of picking and shelling. The Natal Common, a two kernelled type, is grown in a small way in some localities and mainly by Natives and Indians. Though picking machines can pick this variety as readily as the Virginia Bunch, it is not popular where large quantities must be picked by hand. The Natal Common has a higher kernel and oil content than the Viginia Bunch.

Nut-rot.—In parts of the Potgietersrust and Waterberg districts the nut-rot fungus (*Sclerotium Rolfsii.* Sacc.) has in recent years caused considerable damage, mainly by rotting maturing nuts from the plants. It can be kept in check by *not* growing groundnuts continuously on the same fields, by removing or ploughing in all maize and sunflower stalks or stubble and other organic material on

which the fungus is propagated. Winter ploughing and deep covering of all *stubble* are of considerable importance. On soils that do not allow deep ploughing, and which are suitable for deep cultivating implements only, a thin-stemmed crop such as millet or some other grass may be grown to permit turning of the sod. Fields on which infected crops have grown should not be planted to groundnuts as a whole again until they are known to be free from this disease.

How to Obtain Groundnut Seed.

Owing to the existing war conditions, the Union may experience a shortage of oil seeds, and in order to overcome this danger, the Controller of Food Supplies, purchased the entire 1941/42 groundnut crop. Compared with those of previous years, last season's crop was exceptionaly small and the chief reason for buying the crop was to ensure an adequate supply of seed.

A portion of the seed has been treated with a seed protectant against soil fungi. Treated seed is being sold at 75s. per bag of 200 lb.; untreated seed is obtainable at 72s. 6d. per bag. Treated, as well as untreated seed has been selected and graded according to size, and is being stored by agents of the Controller at Nylstroom, Potgietersrust and Naboomspruit, and the prices quoted above are f.o.r. at any of these stations.

Orders for seed should be addressed to the Controller of Food Supplies, Union Buildings, Pretoria. Cheques or money orders should be made payable to the Controller of Food Supplies, and commission on cheques need not be included. Railage must be added to the purchase price of groundnuts to be despatched to sidings. Orders for quantities less than 100 lb. will not be executed and c.o.d. orders will not be accepted.

It should be noted that the groundnut seed is sold for planting only and is to be used for no other purpose whatever.

Loan Scheme.

In order to encourage the planting of groundnuts a loan scheme has been instituted. This scheme will operate only in certain areas of the Union where:

(*a*) groundnuts have been grown on an extensive scale in the past, viz., the Potgietersrust, Waterberg and Pietersburg districts;

(*b*) certain other areas where in all probability groundnuts may be grown successfully.

In the Potgietersrust, Waterberg and Pietersburg districts loans will be granted for the purchase of not more than 10 bags of seed (approximately £40), while in the new potential areas loans will be granted for the purchase of not more than 3 bags (£12) per applicant. The areas in which loans will be granted for not more than 3 bags comprise the following districts:

Kroonstad, Bothaville, Klerksdorp, Ventersdorp, Lichtenburg, Marico, Potchefstroom, Pretoria, Letaba, Nelspruit, Pilgrims Rust, Barberton, Lydenburg, Groblersdal and the whole of Natal, with the exception of Impendhle, Ixopo, Richmond, Kranskop, Bulwer, Underberg, Polela, Lions River, Babanango, Durban, Msinga, Ndwede, Umlazi, Nkandhla, Entonjaneni, (Eshowe) Nongoma, and Mahlabatini districts.

This difference in the amounts made available in the two areas, is due to practical limitations with regard to labour, picking and

[*Continued on page 670.*

Maize for Ensiling.

I. J. Smuts, Farm Manager, College of Agriculture, Glen.

SILAGE is a preserved, succulent feed. It effects its own preservation in the same way as milk does when it turns sour, i.e., by developing and retaining certain organic acids in the mass. These acids, chiefly lactic and acetic acid, are produced by certain bacteria from the sugar present in the plant material. Since the occurrence of these bacteria is very general, the processes of acid production and preservation are practically automatic provided, (1) the material used for silage is succulent and contains sufficient sugar so that the sap liberated under pressure will form a base in which the bacteria can live and produce acid, (2) the acids are not removed by any one of the various methods. The principal way in which acids are removed is through the action of other bacteria which oxidize the acids in order to obtain energy for their own vital processes. This, however, takes place only when considerable quantities of air remain in or enter the mass of silage.

In order to retain the acids, therefore, and to keep out these bacteria, it is necessary to exclude permanently all air. From a liquid such as milk air is naturally excluded, but in a substance composed of material such as maize stalks, air remains in or enters the small spaces between the stalks, unless this is made impossible by subjecting the material to pressure. This pressure prevents the entrance of air from the outside, and at the same time the still living plant material will be able to eliminate the oxygen remaining in the mass, in the process of respiration.

Forms of Silage Production.

The most practical method of obtaining the necessary pressure is to stack the material to such a height that the weight of the upper layers compresses the material lower down. This is important, especially in a stack silo, since it prevents the entrance of air from the sides and squeezes out sap in which the bacteria can produce the acids inside the mass.

It should be noted that in a mass of silage ten feet high, the pressure will be sufficient to exclude air from the lower five feet only, whereas in a column of about 20 feet high the lower fifteen feet will be under sufficient pressure. In practice the most suitable height or depth for a column of silage, therefore, is at least 15 to 20 feet.

This height may be reached by, (1) stacking uncut stalks in ordinary stack form; (2) packing uncut or cut maize plants in a pit silo; (3) blowing or hoisting cut maize into a tower silo. In all cases the material should be well pressed down, especially along the sides.

The making of silage is, therefore, a comparatively simple process provided suitable plant material is placed under sufficient pressure in a stack, pit or tower to exclude air and squeeze out the sap.

Material Suitable for Silage.

Almost any succulent plant material may be used for making silage, though in practice the farmers' choice is limited to crops which, (1) may be easily cultivated, reaped and ensiled; (2) will give large yields per morgen and so reduce the cost of production per ton of silage; (3) have thick stalks which will not dry out

while the crop is being reaped, carted and ensiled, and (4) contain sufficient sugar for the production of the acids necessary for preserving the silage. Experience has shown that the maize plant is the most important silage crop, not only of the summer-rainfall area of South Africa, but of the world.

The suitability of maize as a dual purpose crop for fodder and silage purposes is clearly illustrated by the following uses to which it may be put, (1) maize planted early may be left for the production of grain, and later plantings may be used to fill the silos in a good season; (2) maize which has been so seriously frost damaged as to be unsuitable for ensiling, even after the addition of water and molasses may still be used as coarse hay, or may be left on the lands to be grazed off in the dry state. Under similar circumstances crops such as sunflower, artichokes, etc., would be quite worthless; (3) if conditions are favourable, i.e., when little rain falls during the process of ensiling and when sufficient labour is available, the fully formed cobs, though still in the soft or doughy state, may be removed from the plants, dried and threshed, and the green stalks ensiled.

Division of Labour.

It is always advisable for the farmer to organise his production activities in such a way as to prevent an accumulation of work at critical times. Part of the maize crop should, therefore, always be ensiled. Maize planted up to two or three weeks beyond the latest planting time for maize for grain production, may be used as coarse hay, even if caught by frost.

In this way the production on a farm may be considerably increased to contribute to the feed requirements in maize-producing areas.

Protein-rich Feeds in Stock Rations.

[*Continued from page* 636.

oil-containing seeds from India; and (3) that serious efforts should be made to supplement this shortage in some way or other in order to prevent the collapse of the entire structure of food production for the population of South Africa.

Production of Protein-rich Feeds.

There are two distinct and obvious ways in which this shortage may be met. In the first instance it is undesirable to reduce the rations of our producing animals, since production would suffer and that must be prevented. The only solution is that we must produce larger quantities of protein-rich feeds. In the second place, we must try to import more in order to build up a reserve.

As regards the first method, viz., increased production of protein-rich feeds, farmers have already been urged to push production to the limit and where conditions are suitable, groundnuts, soybeans, cowpeas and other varieties of beans should be grown, as well as lucerne. All of these are feeds rich in protein. In regard to increased importation, the Department of Agriculture and Forestry is at present endeavouring to accomplish this, but negotiations take time and we cannot afford to wait.

It should be the aim of this country to become self-sufficient as regards stock feed, and it is certainly amazing what can be done in this respect if determined efforts are made. The writer has, for instance, visited several dairy farmers on the Springbok Flats and found that they were feeding their cows mealie meal and soybean meal which they themselves have produced. Those farmers are not

[*Continued on page* 661.

Espacement in Maize Production.

Dr. A. R. Saunders, Deputy Director of Production.

THE most important cause of losses in maize yields is lack of moisture, and next to efficient weed control a factor of profound significance in relation to the drought endurance of the crop, is espacement. During unfavourable seasons the distance of planting may, in fact, make all the difference between a crop failure and a reasonable success. The thicker the stand of maize the greater the amount of water used by the crop, and successful production can result only when there is an approximate balance between moisture requirements and effective rainfall.

A fatal combination under droughty conditions is that of too close spacing and heavy weed infestation, and it is no exaggeration to state that on many farms, maize yields can be doubled by a correctly adjusted espacement and effective weed control. The remarkable fact is not how little but how much drought an average maize crop can endure if given the right cultural treatment.

No hard and fast rules can be laid down as to the best espacement for any particular area, for the optimum stand will vary according to average rainfall, the fertility of the soil and the variety used. The higher the rainfall, the greater the fertility of the soil and the earlier in maturity the variety, the closer can be the spacing. The farmer must therefore judge for himself in the light of his particular circumstances, so long as he takes full account of the fact that it is not the high yields in good years or even fair average yields that matter so much as *consistency and reliability of production*.

Spacing Trials.

In this connection the data from an experiment at Potchefstroom during the five-year period 1926-1931 are illuminating. The rows of maize were 3 feet apart in all cases and the spacing given is that in the row.

Spacing.	Yield of maize grain, in bags per morgen.					
	1926-27.	1927-28.	1928-29.	1929-30.	1930-31.	Average.
18"...............	9·6	11·7	27·4	27·1	22·1	19·6
24"...............	10·8	15·0	25·5	26·8	23·7	20·4
36"...............	15·4	18·1	23·4	21·6	21·8	20·1

Although the average yields were approximately equal, the consistency of yield was greatest at the 36-inch spacing. These results have been confirmed by later and more extensive experiments in which the average number of ears per plant, the mean weight of grain per ear and the ratio between the yield of grain and that of the stover—dry stem and leaf—have also been determined. The undermentioned data for 1938-1939, a favourable season and 1941-42, a poor season are of interest.

There is obviously a definite and positive relationship, even in a favourable season, between the spacing between plants, and the other factors studied. In other words, the smaller the distance between plants the lower is the average number of ears per plant, the weight of grain per ear and the ratio between the yield of grain and that of stover. The greatest effect of the adverse conditions which obtained

Spacing in the row.	Mean No. of ears per plant.		Mean weight of grain per ear (lb.).		Mean ratio of grain to stover.	
	1938–39.	1941–42.	1938–39.	1941–42.	1938–39.	1941–42.
12″..............	0·94	0·24	0·25	0·18	0·84	0·22
18″..............	0·99	0·45	0·34	0·28	0·92	0·45
24″..............	1·00	0·51	0·42	0·32	0·94	0·51
30″..............	1·06	0·55	0·46	0·36	1·00	0·62
36″..............	1·08	0·71	0·46	0·38	1·03	0·81

during the past season was shown in a reduction in the number of ears per plant. Undoubtedly the prevalence of barren stalks or blank ears, especially in dry seasons, must in large measure be ascribed to an undesirably close spacing.

A further fact implied in the data and one of particular importance in these days of labour scarcity, is the higher cost of harvesting from a close than from a wide spacing. From this point of view, as well as that of greater reliability of yield, is it quite possible that even a slightly lower average yield from wide than from close spacing might not be such a disadvantage as it would appear. Another factor to consider is the present shortage of phosphates. On land where no phosphate or other manure of equivalent value is applied, fewer plants per morgen should be allowed than normally. If both rainfall and soil productivity are considered, experimental results indicate that if conditions are such as to render impossible a yield of more than 20 bags per morgen from any spacing, the average distance between plants should not be less than 30 to 36 inches. Except in limited areas of high rainfall and fertile soils, the minimum distance between plants throughout the whole maize-growing area should probably not be less than 24 inches in the case of large, late maturing types, and 18 inches for vegetatively small varieties with a short growing period.

Maize for Fodder.

This statement, of course, applies only when grain production is the primary object. For purposes of ensilage or fodder, the espacement can, with advantage be appreciably closer, though, here too, a limit is soon reached beyond which the risk of crop failure is greatly increased. A safe guide is that for ensilage, the amount of seed planted per morgen may be 50 per cent. and for hay or dry fodder 100 per cent. greater than for grain.

Admittedly, wide spacing might result in losses during seasons of high rainfall, but such losses are usually far outweighed by double gains in dry years of higher yields as well as better prices. The intention of these remarks is not to encourage pessimism but to guard against unhealthy complacency.

Taints in Eggs.

Eggs readily take on taints and shell blemishes. Much of this will be prevented if before packing them, the flats, fillers and other packing material are removed from the box and all thoroughly aired and sunned.

[E. F. Lombard, Professional Officer (Poultry), East London.]

Soybeans for the Maize Area.

J. J. du Toit, Lecturer in Field Husbandry, College of Agriculture, Potchefstroom.

THE production of maize on the same land year after year is still a common practice in most parts of the maize-growing areas. The evils of such a continuous single cropping system are unfortunately not readily recognised by many farmers, since they manifest themselves gradually and are to some extent minimised by the use of artificial fertilizers. The present scarcity of fertilizers might result in the more effective utilization of animal manures and compost

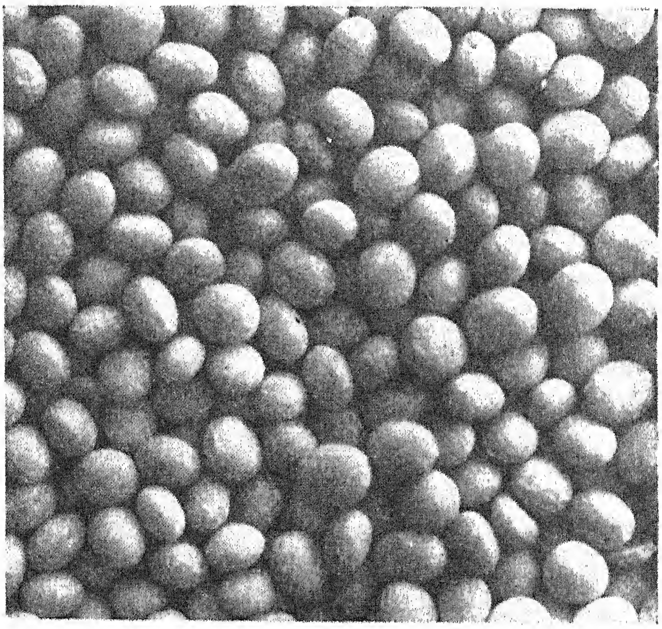


FIG. 1.—Soybean seed, natural size.

material, and the adoption of sounder systems of crop rotation. Not only will the production of legumes and fodder crops in rotation with maize assist in maintaining soil fertility, but various fungus diseases which are becoming a serious menace in the maize area, will be brought under better control, while a greater variety of fodder and commercial crops will be available to the advantage of both man and beast in this country.

Value of the Soybean.

The soybean can be recommended as one of the most suitable legumes in rotation with maize. It succeeds well on the highveld and in other areas with a fairly high summer rainfall, while it is an excellent crop to replace maize partially, in view of its many uses and good qualities. Up to the present there are only a very few suitable legumes for rotation with maize on a large scale. Most maize farmers prefer cash crops which require more or less the same implements and cultural treatment as maize and which will at the same time ensure a comparable income per morgen. Now that suitable varieties of soybeans have been bred, this crop offers great possibilities for solving the problem. Its merits are indeed such that the crop can

be called a wonder crop. Owing to the exceptionally high protein content of the seed it is an excellent substitute for meat as a foodstuff for human beings. In fact the Chinese and Japanese nations depend upon this wonder bean for their subsistence. The seed also contains a high percentage of oil which is used in soap and candle-making, and in the manufacture of paints, linoleums, etc. The oil cake is not only a valuable stock feed, but it is also used industrially for the manufactue of articles such as knife handles, ash trays, artificial ivory, steering wheels of motor cars, explosives, artificial silk, etc. From the farmer's point of view the bean is most valuable as a protein-rich stock feed. The beans in the form of meal and the plants in the form of hay will be of the greatest economic importance to self-supporting stock farmers at the present time, when protein-rich concentrates are so scarce and expensive.

Suitable Soils.

The soybean is an erect growing summer crop which requires a warm growing season of 4 to 4½ months. The plants are not subject to rust and therefore succeed well in the mist-belt and other areas where ordinary beans are, as a rule, severely attacked. Attention can be drawn to the fact that soybeans, like ordinary beans, are susceptible to eelworm or nematode attacks and should, therefore, not be planted on soils infested with this pest.

Most agricultural soils which are not too acid or infertile, are suitable for the crop, especially fertile sandy loam soils. If soybeans are grown in rotation with other crops, fertiliser can be applied to the preceding crop, but in the case of poor soils a direct application of 200 or 300 lb. superphosphate per morgen will be beneficial. Where the crop is to be grown for the first time on a particular land, it will be advantageous to inoculate the soil with the specific nodule-forming bacteria of soybeans, by treating the seed with bacterial cultures obtainable from most seed merchants. Ensure that the proper culture specifically prepared for soybeans is obtained. Full particulars in regard to the treatment of the seed with the culture are given on the container. The seed so treated should be spread out in a shady place to dry off somewhat and then planted immediately afterwards. The fertiliser should be applied to the land prior to planting of inoculated seed, to prevent harmful effects to the bacteria. The application of fertilisers through fertiliser attachments when inoculated seed is planted should therefore be avoided.

November and the beginning of December is the best time to plant soybeans in most areas. It is also advisable to destroy one or two crops of weeds before the crop is planted. Planting is accomplished by means of a maize planter. The seed is drilled in rows 30 inches apart with a 2 to 3 inch spacing in the rows. For hay production the rows can be closer, commensurate with inter-row cultivation later. Ensure (1) that the planter does not break or split the seed (if this should happen then the springs underneath the shoes or separators over the plates in the seed-hoppers should be removed), (2) that the seed is not planted deeper than 1½ to 2 inches, and (3) that the seed is planted in moist soil for best germination results.

Varieties and Yields.

As regards suitable varieties it can be emphasised that only the improved non-shattering strains bred at the Potchefstroom College of Agriculture can be recommended, especially strains No. 34 S.51 and 34 S.395. Approximately 60 to 80 lbs. seed will be required per morgen. One or two judicious harrowings and frequent subsequent

cultivations are important measures to ensure a bumper crop. For seed production the plants should be cut (by means of a mower or selfbinder) as soon as the pods turn brown and while the stems are still somewhat succulent. The material is then placed in small cocks to dry out completely for several days and subsquently carted to the threshing floor to be threshed by means of a wheat thresher suitably

FIG. 2.—Cutting soybeans for hay at Potchefstroom College of Agriculture.

adjusted or a special bean threshing machine. Yields of 8 to 20 bags of beans can be obtained per morgen, depending on soil and moisture conditions and cultural treatment. For hay or ensilage purposes the crop must be cut as soon as the pods are well formed and before the leaves turn yellow. Further particulars on the making of hay and silage, on sources of seed and bacterial cultures, can be obtained from the Agricultural Colleges (also see reprint No. 1, F. in S.A., 1942.).

Protein-rich Feeds in Stock Rations.—

[*Continued from page* 656.

dependent on groundnuts grown in India, but carry on with what they produce on their own farms. There may be farmers who will not find it possible to become independent to such an extent, but all farmers should try to produce as much of their feed requirements as possible. By producing more green feed, hay (which should be cut at an earlier stage) lucerne hay, and cowpea hay they will materially assist in overcoming the acute shortage of proteins.

Producing animals such as cows, pigs and fowls require constant feeding, but many other animals require supplementary feeding during winter and times of drought. We must, therefore, prepare ourselves for such emergencies.

As a last word, an urgent appeal is made to everybody to avoid all waste of stock feed. The country is threatened with a shortage of bonemeal. Since bones are probably scattered all over our farms, they should be collected and sent to the nearest bonemeal factory. If this is impracticable, farmers should enquire from the Controller of Food Supplies as to how these bones can be collected most effectively in order to contribute to the effort of supplementing the shortage of protein-rich feeds in the country.

Manure, Compost and Fertilizer.

J. van Garderen, Senior Professional Officer, Division of Chemical Services.

FROM the earliest times, the application of manure (stable, kraal, bird, bat manure, etc.) has been a universal method of stimulating plant growth.

Compost has long been used in oriental countries but it is of recent introduction in European countries, and in South Africa it is still almost a novelty. Some farmers regard the use of compost as merely a new fashion, until they become convinced of its incalculable value.

Fertilizers, or to be more specific, the mineral nitrogenous phosphates and potash fertilizers, assumed importance during the nineteenth century and are used mainly for the more intensive production of crops. These fertilizers are applied to stimulate general growth, to supplement a shortage of specific plant foods in the soil, or to replace what has been removed from the soil, the only object being to increase production. It is, for instance, generally known to-day that most South African and Australian soils are seriously deficient in phosphates, hence the increased use of phosphatic fertilizer as compared with nitrogenous and potash fertilizers.

Quality of Soil and Water Requirements.

For the normal production of crops, such as fodder, cereals, fruit, vegetables, etc., certain requirements are necessary of which the depth and fertility of soil and the provision of water are the most important. All cultivated soils are not equally deep and fertile, and water is not aways available.

It is somewhat strange that many of our most fertile soils are situated in dry areas like the Karroo, while relatively poor soils are found in areas with an abundance of water as is the case in the high-rainfall coastal areas. In both cases, however, matters can be remedied to a certain extent, i.e., by irrigating the former and fertilizing the latter.

Irrigation must undoubtedly have a decisive effect on production, otherwise the expense which it involves would never be justified. The problem is not solved, however, by constructing a storage dam or by digging irrigation canals. Production under irrigation is very soon restricted by the decreasing fertility of the soil, which can be maintained, however, or even improved by judicious fertilizing.

Fertilizing.—Fertilizing is not a simple process and advice which can be applied to all soils cannot be communicated merely by giving a formula, recipe or prescription. Nature follows its own course and every disturbance, whether accidental or caused by human agency, is followed by a certain reaction towards restoring the balance.

A soil has or shows a shortage of a particular plant nutrient only when the available amount present in the soil is so small as to make normal or optimum growth of plants impossible. Optimum production is obtained as soon as this deficiency is properly remedied. The absence or partial absence of different plant nutrients can therefore have a limiting effect in different degrees and at the same time.

Application of Fertilizer.

When such a deficiency has been supplemented, the natural result is that the increased growth of the plant demands more nutrients, water, etc. Consequently all these factors have to be

considered in drawing up a fertilizer plan for any specific case. Where an unlimited water supply is available, as under irrigation, larger amounts of fertilizer can be prescribed than under relatively dry conditions; production will then keep pace with the amount of fertilizer applied. If the water supply is limited, as is often the case in summer-rainfall areas, relatively heavy applications of fertilizer may even have harmfull effects.

Of the mineral fertilizers, *potash* has, according to experiments carried out over a number of years, practically no beneficial effect on the yield of cereal crops. In dry-land farming, *phosphates* (super, rock and bone-meal, etc.) are essential while nitrogen plays a minor rôle. Exactly the opposite is true in the case of irrigated lands and here such *nitrogenous fertilizers*, as ammonium sulphate, sodium nitrate, blood-meal, etc., are by far the most important requirements, followed by phosphates.

Mineral nitrogen and phosphate fertilizers usually contain from 15 to 20 per cent. of the respective plant nutrients. Kraal manure, stable manure, all types of compost, etc., contain an average of only one-twentieth to one-tenth of these amounts. Where manure or compost is therefore applied as a substitute for mineral fertilizer, approximately one ton should be used in the place of every hundred pounds of fertilizer. There are no dangers attached to this when it is applied to the lands under cultivation, but rather additional advantages. These organic manure fertilizers contain not only both nitrogen and phosphate but also a mixture of lesser known essential elements and especially organic matter (humus) which possesses very valuable and beneficial qualities. They greatly improved the structure of the soil and its water-retaining capacity under severe desiccating climatic conditions.

Organic Fertilizers.

A similar substitution of essential mineral phosphate fertilizers by organic fertilizers under dry-land farming, is, however, accompanied by a certain element of danger. The extraordinary and luxuriant vegetative, growth e.g., of maize, under the influence of the nitrogen in the manure, which can usually be observed immediately after the first rains, requires so much moisture that a bad distribution of rainfall later on will affect these plants to such an extent that the grain crop may even be affected adversely in comparison with maize which received no manure. If less manure is used to prevent this, the phosphate deficiency has such a limiting effect that the advantages of using manure become doubtful. From fertilizer experiments carried out during the last six years, it appears that any increase in the maize yield as a result of the application of kraal manure must be ascribed in the first place to the phosphate content of the fertilizer.

Chemical analyses, however, show that where the quantitative effect is not noticeable the quality of such maize is nevertheless much higher.

The following remarks, therefore, apply in cases where organic fertilizers are used to maintain maize production in times of phosphate scarcity:—

(1) Applications of 5 tons or more per morgen ensure higher grain yields, but this gain is not sufficient to justify the cost of the fertilizer.

(2) Relatively light applications of say, 1 ton per morgen, seem to be justified if accompanied by (*a*) a certain amount of mineral

phosphate fertilizer, and (*b*) more intensive and effective weed control so that all soil moisture is made available for the maize plants.

This is true especially of those areas where the fertilizer is applied in the rows and is not broadcast.

Where manure and compost are broadcast and ploughed in, it is not necessary to use them in finely ground (and therefore more expensive) form. There is naturally more justification for its use if it is to be applied not for the production of grain but fodder crops and maize for ensiling. In comparison with maize, wheat apparently makes much better use of such organic fertilizers and where a farmer grows both of these cereals, the wheat rather than the maize should receive the fertilizer. In certain areas of Natal with an annual rainfall of 30 inches and more, kraal manure and compost have a much greater and more beneficial effect on both stalk and grain production, than in the Orange Free State and other areas with a rainfall of 15 to 20 inches. Manure and compost also have a beneficial effect on yields in cases where vegetables are grown intensively. In areas with a low rainfall, where farmers used to apply phosphates fairly liberally and regularly, one, or at the most, two reasonably good maize crops may be expected without any further fertilizing. There is nothing, however, which can be substituted for phosphate in cases where it is essential for production: other sources of this mineral must, therefore, be exploited no matter how low the phosphate content of the substances may be.

Summary.

1. On all soils *under irrigation* the liberal use of compost and all organic fertilizers, even in quantities of 30 tons or more per morgen, is essential and beneficial for almost every kind of crop.

2. In the *high-rainfall areas*, such as the highveld of Natal and portions of the Eastern Transvaal and north-eastern Orange Free State with an annual rainfall of 30 inches or more, the use of compost and organic fertilizer is strongly recommended. In these relatively cold areas with leached soils, excellent and profitable results are obtained if the fertilizer is applied in the rows. This also aids weed control since the crop plants are in the early stages enabled to outstrip the weeds. Potatoes, root crops and artificial pastures especially, will repay a regular application of such fertilizers.

3. In the *low-rainfall areas* such as the north-western Orange Free State and Western Transvaal, the liberal use of organic fertilizers is not justified and cannot, mainly on economic grounds, be recommended at present. Sustained and increased production of cereals on an extensive scale should rather be based on a more judicious use of available phosphates and the application of sound methods of crop production.

Avoid wasting manure, make compost in the manner best suited to your needs, and if you are not sure how to make the best use of this together with your phosphate ration, ask the extension officer or College of Agriculture serving your area. Manure, compost and fertilizer are to-day more important than ever before.

Leaking Roofs.

Holes in the roof or walls of galvanised iron fowl-houses, causing leaks and draughts, can be effectively closed up with putty, over which a coat of paint should be applied.

[E. F. Lombard, Professional Officer (Poultry), East London.]

Spineless Cactus.

F. H. Bosman, Senior Research Officer, Grootfontein College of Agriculture.

THE effects of drought to be seen over a wide part of the Union at present again serves to emphasise the need for the production of drought resistant fodders and feed reserves. As such, spineless cactus has a wide use.

Because of its high water content it is not of high feeding value and being low in protein content it does not approximate a balanced ration, but it does provide heavy yields of succulent feed which is

Fig. 1.—Spineless Cactus before harvest.

invaluable in times of scarcity especially if it can be supplemented by a small ration of lucerne hay or similar feed.

Annual yields of 20 to 40 tons per morgen can be expected under average conditions. As many as 40 sheep per morgen or more can be carried by this crop during the four winter months in the central Karoo. As a supplement for veld grazing it has also produced very favourablè results.

Planting.

Spineless cactus is adapted to a wide area, the minimum rainfall requirement for its cultivation being about 10 inches per annum. It responds best on deep fertile soils, and the fact that its prototype is found mainly on hillsides must not be taken to indicate preference for a stony habitat. Natural distribution is determined primarily by temperature factors and this fact should be borne in mind when selecting the site for a plantation.

Although differences in resistance to low temperatures are found in varieties, these differences are not significant enough to outweigh other considerations such as yields, palatability and absence of spines and spicules. The selection of a high-lying site with a north-easterly aspect or otherwise sheltered position will do more to ensure success than reliance on the frost resistance exhibited by any variety.

Planting should take place during or soon after September. Late planting results in immature growth at the end of the season which is liable to be frosted during the following winter.

Preparation of the land by ploughing or contour strip ploughing should be done where possible. Planting on unprepared ground restricts growth.

The common method of establishing the crop is simply, by laying the 'leaves' down with a clod of soil or a stone to hold the 'leaf' in place but experiments indicate that upright planting gives more rapid early growth. Slight drying of the 'leaves' before planting is generally advocated.

The rows should be sufficiently wide apart to allow a wagon to pass between them. The plants should be spaced not less than 6 to 8 feet in the rows.

Grazing.

The shape of the plant can be modified considerably by pruning during the first three seasons. By allowing two, or preferably three, 'leaves' to develop from the basal member and again two or three from each of these, a relatively low frame can be developed. This is of importance where the crop is intended for grazing.

Spineless cactus can be grazed by small stock to good advantage provided overgrazing is strictly avoided. Grazing with large stock is less satisfactory because of breakage which usually results..

Experiments show that the plants can be harvested to the three main stems, referring to above, without affecting recovery adversely, however, grazing must not be done to this extent. Pruning after grazing to maintain shape, and feeding the prunings off the plantation is recommended.

Cactoblastis cactorum is widespread, and a constant lookout for its appearance in the plantation should be maintained. Its control is greatly facilitated by annual grazing and harvesting, and where the insect has made its appearance the plantation should not be allowed to grow freely. This obviously necessitates establishing not more than can be utilised annually.

For purposes of harvesting and grazing and for observing and removing Cactoblastis egg-sticks, close planting should be avoided.

Varieties.

While the term 'spineless' is freely used, few varieties are entirely free of spines througout the year. The small barbed spicules are often present on spineless varieties in large numbers and cause inflammation of the intestinal tract and should therefore deserve more consideration than has been given them in the past.

Of the 27 varieties being tested at the Grootfontein College of Agriculture, only the two varieties, viz., Protectorate and Arbiter, may be considered to be free of both spines and spicules throughout the year. Unfortunately these varieties are not good yielders. Certain varieties produce up to two crops of spines and three crops of spicules per annum.

Yields vary by over 600 percent, and a wide range in palatibility exists. The varieties *Nudosa, Montery, Robusta* and *Chico* are definitely unpalatable and are not recommended for planting.

When freedom from spines and spicules as well as yielding ability, frost resistance and palatability are taken into consideration, *Skinner's Court* must be considered the leading variety. *Sicillian Indian Fig* is not quite as high yielding as the former, but has other good qualities and is probably the most frost-resistant of the varieties

grown at the Grootfontein College of Agriculture. The variety *Malta* is also high yielding and frost resistant, but is more spiny than the above.

Supply of Leaves.

Owing to the spread of Cactoblastis and the limited quantities of the newer varieties available at the Grootfontein College of

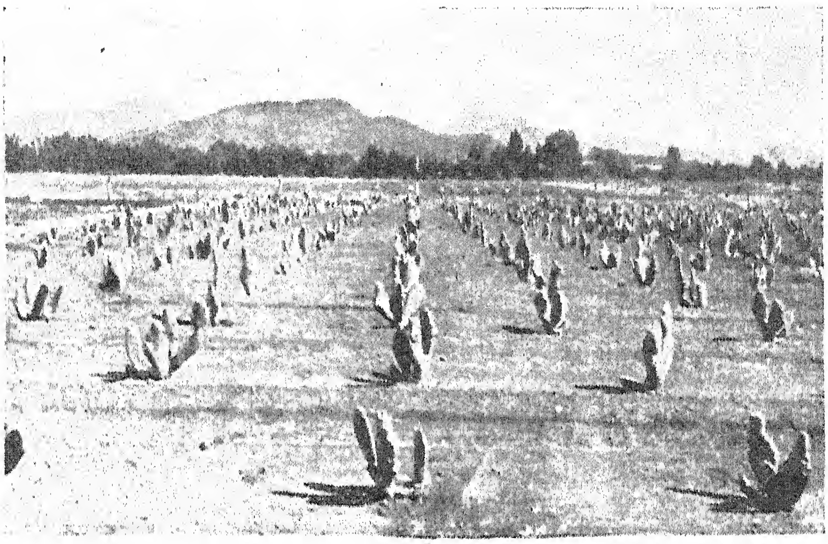


Fig. 2.—Spineless Cactus after harvest.

Agriculture, supplies to individuals are limited to 100 'leaves' of two varieties at 3s. per hundred 'leaves' c.w.o., f.o.r.

Owing to scarcity of bags buyers must supply two bags per 100 'leaves' ordered, but these must not be forwarded until buyers have ascertained that their orders can be met.

Success with Poultry.

Insects on broody-hens.—If a broody hen is well dusted with insect powder, before she is set, and the treatment repeated after the first and second week, there will be no insects to worry her baby chickens. A mixture of equal parts, by measure, of sodium fluoride, flowers of sulphur, slaked lime, and tobacco dust, makes a very effective insect powder. It should be stored in a tin with a tight fitting lid.

Moulting hens.—Douglas mixture which is a splendid tonic for moulting hens, is made by dissolving ½ lb. sulphate of iron in 1 gallon of water, to which ½ oz. sulphuric acid is added, and then a dose of 2 desertspoons is given in every gallon of drinking water. The tonic may be given for two or three weeks. Wooden, china or enamel water receptacles must be used, as the mixture corrodes metal.

Spur growth in cockerels. To stop spur growth, the spur caps are cut off when they are not more than ¼ inch long, and the wounds rubbed with potassium hydroxide.

[E. F. Lombard, Professional Officer (Poultry), East London.]

The Production of Root Crops.

W. O. Schultz, Lecturer in Field Husbandry, Cedara.

THE term "root crops", as commonly used by farmers, covers a wide field. It includes the mangel or mangold, rape, kale, turnips, swedes, and chou-moellier which are valuable stock feeds. These crops, with the exception of the mangel, require a comparatively cool growing period and, owing to their frost resistance, they are mainly treated as winter crops in this country. To grow them successfully, adequate rainfall in autumn and winter or irrigation is necessary. Mangels, although frost resistant to a degree, are partial to hot and dry conditions and are therefore generally regarded as a summer crop. In spite of this, however, they are sometimes planted in January, February or even March and allowed to grow through the winter, provided there is an adequate supply of moisture and absence of severe frosts. Winter roots when grown during hot weather are very subject to attack from aphids and the so-called cabbage or diamond-back moth, and they are also liable to be destroyed by cabbage rot and black leg.

Suitable Soils.

As with practically all deep-rooted crops, the selection of the correct type of soil is important. Best results are obtained on friable, open and well-drained soils which are adequately supplied with organic matter. While drainage is important ,a good water-holding capacity is just as essential, and therefore the very heavy and very sandy soils are best excluded. Many farmers object to the use of old lands, maintaining that only virgin soil can yield profitable returns. While the value of newly broken soil is by no means disputed, it should be pointed out that equally good results can be obtained on lands which have been under cultivation for many years, provided they are well prepared and their fertility has been maintained. How else could some of the soils of Europe which have been under the plough for generations still produce their high yields of mangels, sugar beet, turnips, etc.? Irrespective of whether the soil is new or old, it must have plenty of available plant food to produce successful root crops. In the case of winter roots it should be borne in mind that conditions during the cooler portion of the year are not as suitable for the exploitation of plant-food resources in soils as they are in summer. This applies particularly to nitrogen. A foundation of kraal manure or compost is invaluable and in addition a suitable fertilizer should be applied. If a heavy dressing of kraal manure or compost is given, 600 to 1,000 lbs. per morgen of superphosphate or fertilizer mixture A. should be sufficient; otherwise applications of 800 to 1,200 lb. per morgen of fertilizer mixtures C., D. or F. should be made, depending on the fertility of the soil. On new lands the need for kraal manure is naturally not as great as it is on old lands. On acid soils a dressing of 2 to 4 tons per morgen of agricultural lime will be found very useful for mangels in addition to manure and fertilizer.

Time of Planting.

Depending on high, middle or low-veld conditions, the time of planting will vary and also according to the time at which it is intended to utilize the crops.

On the highveld, with its colder growing conditions, winter roots are generally planted in December or January. For the middleveld February and March are the best months, and in warmer climates

even later seedings may take place. Mangels, if grown entirely as a summer crop, are best planted after the first good rains in spring, i.e., generally from October to early November.

In view of the present difficulty in obtaining root seeds no special recommendations can be made as to varieties. It is a case of planting what is obtainable.

Rates of Seeding.

If sown direct on to the field, the rates per morgen are as follows: Rape 6 lb., turnips and swedes 3 to 4 lb. chou-moellier and kale 4 lb., and mangels 20 lb.

In order to save seed, root crops are sometimes sown in seed-beds and the young plants transplanted into the field. Likewise thinnings, e.g., plants removed during the thinning of a crop are often used for transplanting. Only kale, chou-moellier and mangels are really suitable for this purpose. Transplanting should be done into a moist soil and preferably on a damp or drizzly day so as to ensure a quick " take ".

Method of Planting.

All root seeds are small and therefore the seed-bed should be fine and firm and the seed should be planted as shallow as possible. Whilst special root planters are obtainable, the drill machine and the maize planter are most commonly used. It is customary to mix the fertilizer with the seed prior to planting, but while good results are obtained in this way, it is necessary to take certain precautions. Root seeds are susceptible to burning and therefore the mixing of seed and fertilizer should be done on the day of planting and not before. In addition, it is advisable to plant on a seed bed which is thoroughly moist in order to procure not only germination, but also to protect the seedling from scorching. After planting, the soil should, if possible, be rolled in order to bring about close contact with the seed and the soil. Mangels, turnips, kale, swedes and chou-moellier are best planted in rows wide enough to allow of cultivation, e.g., generally 3 feet apart. Rape, although it can also be planted in rows, is more often sown broadcast. For this purpose the barrow type of seeder with revolving brushes has given good results. Owing to the small quantity of seed sown, hand broadcasting is not very satisfactory.

Cultivation.

This is one of the most important phases in the production of row-planted root crops. It not only entails the control of weeds and the formation of a mulch on the soil, but also correct thinning. From the moment the young plants are visable, cultivation should commence. The ordinary row cultivators are suitable for this purpose. When the plants have reached the four-leaf stage, they should be thinned out to distances ranging from 8 to 10 inches for swedes and turnips, and from 12 to 18 inches for kale and chou-moellier and mangels. This operation of thinning is very important since it has been proved that a properly thinned stand will give heavier yields than one which has not been thinned at all or thinned when the plants are too far advanced. This thinning does not apply to rape.

Harvesting.

Here, the economic aspect has to be considered. Grazing is the cheapest means of harvesting and should be employed wherever possible. The electric fence will be found useful in regulating the

grazing. Rape can be grazed without any difficulty, although it is sometimes cut and fed off the land. The tops of turnips and swedes can be grazed first and the tubers lifted subsequently. Kale and chou-moellier are best cut, since considerable waste occurs through grazing. It should be borne in mind, however, that all these crops when grazed are apt to cause bloating and the necessary precautions should therefore be taken. Mangels are best lifted and fed, and they do not produce bloat

A good stand of rape should produce 20 to 30 tons per morgen; turnips and swedes 30 to 50 tons, kale and chou-moellier 30 to 60 tons and mangels 60 to 80 tons per morgen. These figures are purposely given on the low side, and much higher yields can be obtained.

Groundnut Production.—

[Continued from page 664

shelling machines as well as the general lack of experience in growing this crop.

Other Conditions.

(i) The loans are repayable 12 months after the date of the promissory note and are subject to a rate of interest of 4 per cent. per annum.

(ii) Loans will not be granted in respect of quantities of seed of less than 1 bag (200 lbs.).

(iii) Loans not exceeding £40 in the recognised groundnut areas and not exceeding £12 in the potential groundnut areas will be considered (as outlined above).

Application Forms.

Before a loan can be granted, the prescribed application form must be completed. Such forms are obtainable from:—

(i) The local magistrate or Justice of the Peace.

(ii) The Extension Officer of the Department of Agriculture and Forestry, where such officers are stationed, or

(iii) From the Secretary of the Waterberg-Ko-operatiewe Vereniging, Nylstroom, and the Secretary, Northern Transvaal Farmers' Co-operative Society, Naboomspruit.

Varieties Supplied.

The seed supplied, either for cash, or under the loan scheme, is of the Virginia Bunch variety. Only where specific orders are received the Natal common type seed will be supplied. Wherever groundnuts are grown it will be essential to destroy weeds *before* and immediately after planting.

Packing.—While the seed is packed in bags of 200 lb. and 100 lb, it would be appreciated if orders are not placed for other irregular quantities.

Packing Eggs.

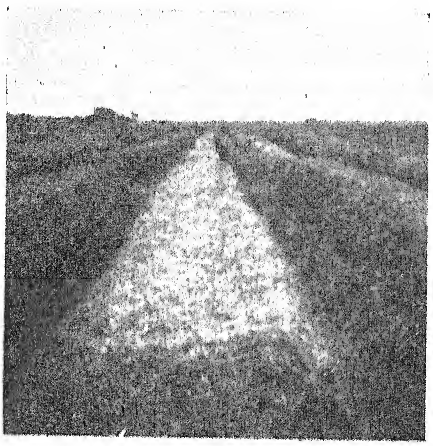
When packing eggs for a journey and there are not sufficient to fill the box, the remainder of the box must be filled with flats and empty fillers topped off with a layer of wood-wool, hay or chaff, in order to prevent the fillers from shaking up and down and thereby damaging the eggs.

[E. F. Lombard, Professional Officer (Poultry), East London.]

Compost for Irrigation Areas.

K. E. W. Penzhorn, Co-ordinating Regional Officer (Food Control), and A. W. Lategan, Extension Officer, Upington.

MOST irrigation areas in South Africa are very similar, especially in regard to the following: (i) They are situated almost without exception in the warm, low-rainfall areas of the country. (ii) Most of them are utilized to a greater or lesser extent for the cultivation of wheat, except when citrus is the main crop. (iii) Lands under irrigation require kraal manure or compost for the maintenance of soil fertility. (iv) The irrigation farmers or setlers keep very few animals, sometimes none at all.



Compost made according to the Soaking-pit method.

In spite of the urgent need of organic manure for irrigation lands, stacks of wheat chaff are still too often burnt instead of being converted into compost. As a result of this malpractice many irrigation lands in South Africa have become so unproductive that farmers have found it unprofitable to continue cultivating the ground. The present scarcity of fertilizer and the endeavour to increase production can only result in accelerating the impoverishment and exhaustion of these soils, unless immediate steps are taken to convert all available wheat chaff and other plant refuse into compost and to return it to the soil.

The kraal method of making compost, described elsewhere in this issue, cannot be applied effectively in most irrigation areas on account of the dry climate and the absence of large numbers of animals.

The Soaking-pit Method.

The following is a practical and inexpensive method of making compost from wheat chaff and manure, which may be mixed with any plant or vegetable refuse on the farm, even with bones, etc. This method has proved successful especially on irrigation farms in the Upington district where it is very warm and the rainfall is low. The chaff should be left to soak in a soaking pit for about four days and should then be stacked on the side of the pit in a narrow heap in layers of about nine inches thick and six feet wide. Each layer of wet chaff is covered with a layer of manure two to six inches thick according to the strength of the manure and the quantity available. The wet straw and manure should be mixed before the following layer is spread. The height should not exceed five layers, when the whole may be completed with a thin covering layer of four inches. Within a few days bacterial activity will rapidly generate heat in the stack until the temperature reaches a maximum, after which the stack will slowly cool off. The compost may be used as soon as it is cold, i.e. after about six to ten weeks.

This process is very simple and practicable in those irrigation areas used for the cultivation of wheat. Excellent compost may be obtained without difficulty provided the air and moisture conditions

required by the bacteria for breaking down the material are carefully regulated. Experience has shown that a width of six feet is most suitable. This allows sufficient air to penetrate from the sides, and prevents the material from being pressed down by the labourer who can then work over the entire surface of the stack without getting on to it. For the same reason the height should on no account exceed five layers.

Since wheat chaff is not very absorbent and must be properly soaked in water, the use of a hose-pipe or buckets for watering will not satisfy moisture requirements, and moreover entails unnecessary work.

An effective soaking pit will reduce the cost of labour to a minimum. The following are its requirements:—

(i) It should be situated so that water may be led or pumped into it, as near as possible to the threshing floor or haystacks.

(ii) If the pit is made watertight there will be no need for continual filling. Wooden poles may be attached to anchors fixed to the sides of the pit to keep the chaff under water and to accelerate soaking.

(iii) A long narrow soaking pit is most effective. For ec[illegible] stacking as described above a pit 4½ feet deep and 6 feet wide [illegible] for the purpose. The dimensions of both pit and stack will [illegible] on local conditions. A soaking pit 15 feet long will be suitable on small irrigation farms where space and the supply of chaff are limited. It may, of course, be lengthened and widened as the need arises.

If there are no animals, manure will have to be obtained elsewhere, otherwise a fertilizer mixture consisting of 60 lb. agricultural lime, 30 to 60 lb. of ammonium sulphate and 30 lb. superphosphate per ton of chaff (dry material) may be used. Bacterial activity will be encouraged if each layer is thinly covered with silt. Lucerne or Indian hemp which have been found unfit for other use may be substituted for part of the ammonium sulphate.

It has been found that, with a moisture content of 50 per cent., a section five yards long of a stack such as described above, weighs two tons. The outer layer of material, which inevitably dries out in the sun and wind before it disintegrates, may be mixed with the rest of the material when applied to the land, or, preferably, returned to the soaking pit.

Many farmers are adverse to the use of kraal manure or compost because of the serious danger of weed infestation. Good compost may safely be used, however, since experience has shown that the viability of almost all weed seeds is destroyed by the high temperatures generated during the process of decomposition.

Every farmer can afford to make compost in this surprisingly cheap way. At Upington, where operations were well regulated, the cost of labour amounted to approximately 10d. per ton and at Rust-der-Winter to approximately 1s. 1d. per ton.

Carbon Tetrachloride (Liver Fluke Remedy).

This remedy, which is recommended for the treatment of liver fluke in sheep, goats and cattle and certain worms of horses and fowls, is now obtainable from the Division of Veterinary Services, Onderstepoort, as follows:—

	s.	d.
In 1 gallon (4,500 c.c.) tins	15	0
700 c.c. tins	2	6

The remedy is issued only for cash with order or C.O.D. and is sent free by rail.

Particulars concerning its use are also obtainable.

The Production of Cowpeas.

Dr. A. R. Saunders, Deputy Director of Production.

THE cowpea is one of the few agricultural crops native to this country and is well adapted to a wide range of soil and climatic conditions. On account of its drought resistance it is of particular value in areas of low rainfall both as food for man and beast and as a soil improver in which respect it appears to enjoy a margin of superiority over many other legumes.

Soil requirements are the same as for maize, and though the crop responds well to high soil productivity it will do relatively better on poor soils than maize or other non-legumes. It therefore finds a fitting place in rotation systems, where it invariably excercises a beneficial influence on the yield of the succeeding crop. The only soils on which cowpeas will not grow well are those which are either very acid or very alkaline, or which are severely infested with eelworm.

Planting.

With cowpeas as with any other crop good farming methods bring a full reward. The first requirement is a well ploughed soil with a surface free from weeds or weed seeds. This involves the destruction of at least two crops of weed seedlings by surface cultivation prior to planting. The best time of planting is from October to the end of November. Most varieties can, however, be planted as late as the beginning of January, though not without suffering losses in yield in some degree.

Several methods of planting may be followed, dêpending upon the relative freedom of the surface soil from weeds. Should the soil be very weedy, it would be advantageous to use the ordinary maize planter and space the rows wide enough apart to permit of inter-row cultivation, but the distance between rows should preferably not exceed 30 inches. With procumbent types the spacing in the row may be as wide as 6 to 9 inches, but in the case of the new upright varieties it should not exceed 3 inches. On clean soil the planter may be set at 36 inches and the rows straddled, thus giving a distance of 18 inches between rows. Alternatively, a wheat drill can be used either with all the spouts open or with every other spout closed up. This method has given excellent results in areas of favourable rainfall. Lastly, the old method of broadcasting the seed is not without merit, especially in the case of the upright strains.

At a high rate of seeding in closely spaced rows the harrow may be employed to continue weed destruction in the early stages of growth, but then only during the first two or three days after planting and not again until the plants have formed their second set of true leaves or are about 4 inches high. After this the crop is usually able to look after itself and may even succeed in smothering to a large extent any later germination of weeds.

Varieties.

The choice of variety is naturally influenced by the purpose for which the crop is grown. For seed production the bunch type "Swartbekkie" is outstanding, while some of the procumbent varieties such as Iron, White Wonder and New Era also give high yields. As grazing crops the last named three varieties have few equals. In the production of hay the upright strains developed at Potchefstroom, lend themselves readily to mechanical handling, but whether or not they will yield as well as the procumbent types

depends largely on the density of the stand. It is manifestly impossible to develop erect growing types capable of carrying the same weight of material per plant as the procumbent varieties, and the lower yield per plant has therefore to be compensated for by having more plants per unit area of land.

Harvesting.

Harvesting for hay should commence as soon as the first pods are well laden. With procumbent varieties the simplest method is to cut off the plants with sharp hoes, cane knives or spades. Upright types can be cut with an ordinary mower or self-binder. The use of the latter is excellent in preventing loss of leaf and in facilitating the subsequent handling of the crop, but owing to the shortage of binder twine it cannot at present be recommended.

After cutting, the plants should be allowed to wilt for two or three days before being gathered. Operations of raking and cocking the hay are best carried out during early morning before the material becomes dry and brittle, as otherwise considerable loss of leaf might occur. Three or four days in the cock is usually long enough for further drying out before baling or stacking. The cocks should preferably be small enough so that two men can load an entire cock on to the wagon in one movement.

In the event of unfavourable weather conditions at the time the crop is ready for harvesting, it may be turned into ensilage. If ensiled by itself, molasses must be added to bring about the right type of fermentation and prevent loss of protein. On most farms the simplest method is to mix the cowpeas with maize, sweet sorghum ("soetriet") or other suitable crop in the process of ensiling. The proportion of cowpeas may be as small as available quantities necessitate but should not exceed one-third or at most one-half of the total material.

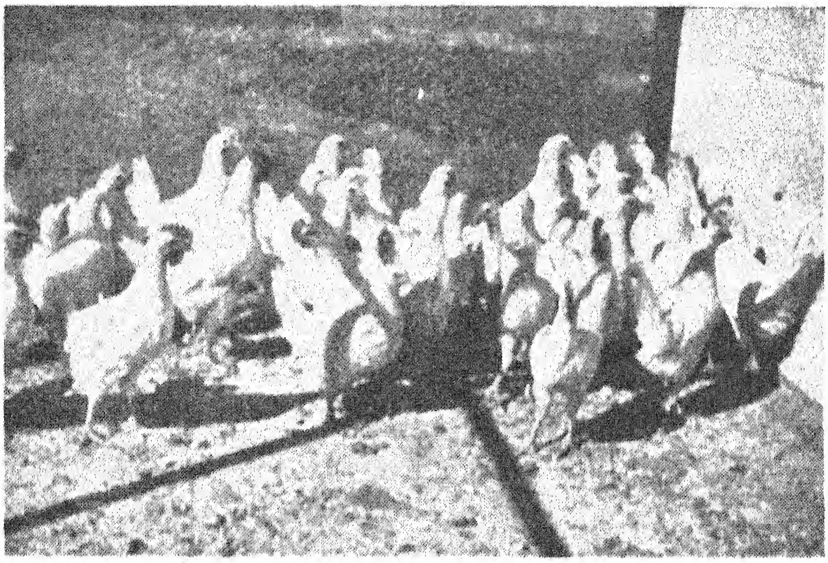
Yields.

As regards yields, 5 tons of hay or 10 bags of seed per morgen can be considered very satisfactory, though double these quantities are sometimes obtained. Moreover, in appraising the value of the crop, its effect on the yield of the succeeding maize or other non-legume must also be taken into account. This effect will vary according to seasonal conditions, soil, and locality, but over a ten-year period at Potchefstroom it has expressed itself as a 20 per cent increase in maize yields the first year after cowpeas and 12 per cent the second year. On soils deficient in nitrogen a much more marked response can be expected. As time passes and a deficiency of nitrogen in the soil becomes more general, the cowpea, in company with other legumes is therefore bound to assume ever increasing importance.

Bean Meal in Chicken Rations.

P. J. Serfontein, Professional Officer (Poultry), College of Agriculture, Potchefstroom.

PROTEINS, in the form of meat and bonemeal, constituted the most expensive ingredient in poultry rations when times were normal, whereas plant proteins, in the form of groundnut-oilcake meal, were used in limited quantities only. The importation of both kinds of proteins on a large scale was due to the fact that local production could not satisfy the demand for them. As circumstances



Group I at the age of ten weeks.

now compel us, however, to rely almost exclusively on local production, the most economical measures should be employed, and every possible source exploited.

The required proteins in poultry rations may be supplied by relying chiefly on plant proteins in the form of leguminous crops, such as soybeans, cowpeas, groundnuts, and common beans (kidney beans, sugar beans, khakie beans, haricot beans, Canadian Wonder, and " mung " or " mungo " beans).

Groundnuts were best known to poultry-farmers in the form of oilcake meal, and were available for poultry in this form only. As the common bean varieties are used almost exclusively for human consumption, it would be uneconomical to utilize them for poultry feed as well, owing to the prices being realized for them.

Fortunately, the grading system for beans has brought large supplies of undergrade beans, classed as Grade B.9 on the market at reasonable prices each year. As these screenings of the bean crop—the shrunken beans and those which have been damaged by frost or insects—are unfit for human consumption, they may be used profitably for chicken feed.

At the College of Agriculture, Potchefstroom, experiments have consequently been undertaken with a view to converting this waste material into suitable chicken feed. Before effective use can be

made of the bean, its deficiences and the manner in which these may be supplemented, must first be determined.

It is important to know that the protein content of the Phaseolus species of beans is deficient not only in cystine, one of the amino-acids essential for the normal vital functions, but also in vitamins and the minerals calcium, phosphorus and sodium.

In the above experiments due account was taken of these deficiencies which were supplemented with ingredients easily obtainable by the practical poultry-farmer. The experiments were, therefore, concerned more particularly with the supplementary value of bean meal in the ration than purely with its nutritive value.

Nature of the Experiments.

The beanmeal used in the experiments was prepared entirely from the common bean varieties mentioned above. The exact proportions in which the different varieties were used cannot be indicated but it may definitely be stated that the mung beans constituted the largest percentage.

The experiment was begun on May 11th, 1942, with 250 White Leghorn chickens divided into 5 groups of 50 each. From the first day and until they were four weeks old the chickens were kept in an electric battery brooder where each group received separate heating in its own compartment. During this period they were fed cod-liver oil as indicated in Table I. After the fourth week the chicks were moved to chicken houses measuring 10 ft. by 12 ft., each with a cement run. These houses were not provided with artificial heating. The chickens were fed green feed consisting of young finely cut wheat once a day until they were three weeks old, and after that twice a day. The rations fed are indicated in Table I.

TABLE I.—*Rations fed from 1 day until 10 weeks old.*

Ingredients.	Groups.				
	1	2	3	4	5
	lb.	lb.	lb.	lb.	lb.
Yellow mealiemeal	55	59	50	46	41
Wheaten bran	16	—	—		
Oatmeal	10	10	10	10	10
Lucerne meal	7	10	10	10	10
Bean meal	—	10	20	25	30
Fish meal	18	17½	14¼	13¾	12
Oystershell powder	1½	1¼	1½	1½	1¾
Bonemeal	—	—	½	1	1
Fine salt	½	½	½	½	½
Codliver oil	1	1	1	1	1
$MnSO_4$	¼ oz.	¼ oz.	¼ oz.	¼ oz.	¼ oz.

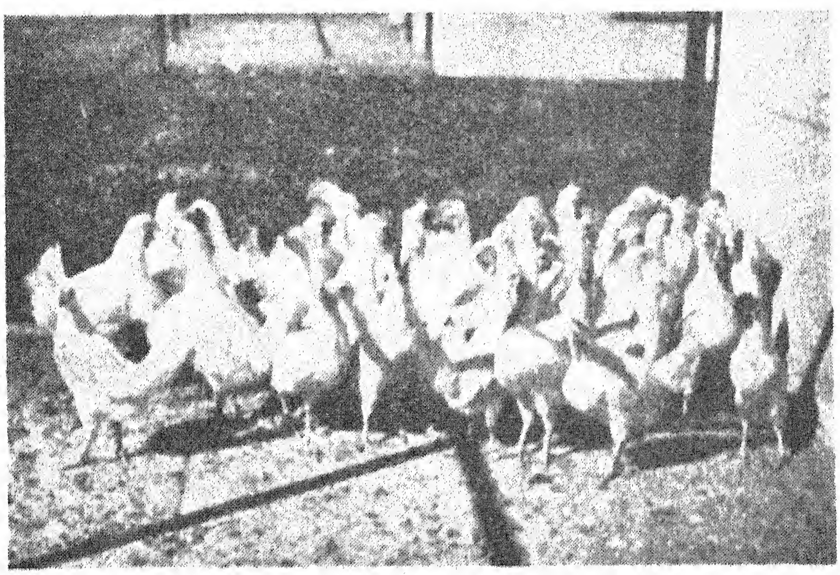
TABLE II.—*Analysis of rations.*

	Groups.				
	1	2	3	4	5
	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
Crude proteins	19·80	19·80	19·70	19·70	19·70
Calcium	1·50	1·47	1·42	1·50	1·50
Phosphorus	0·90	0·77	0·77	0·78	0·77
Crude fibre	4·70	4·60	5·10	5·30	5·60

TABLE III.—*Average weight and feed consumption per chick at the ages of 4, 8 and 10 weeks respectively.*

Group.	Fourth Week.			Eight Week.			Tenth Week.		
	Cockerels.	Pullets.	Feed Consumption.	Cockerels.	Pullets.	Feed Consumption.	Cockerels.	Pullets.	Feed Consumption.
	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.
1	0·44	0·42	0·92	1·35	1·23	3·81	1·84	1·53	6·07
2	0·49	0·50	1·05	1·38	1·26	3·74	1·90	1·64	6·01
3	0·49	0·42	1·02	1·53	1·34	4·00	2·06	1·72	6·37
4	0·47	0·43	1·03	1·47	1·28	4·13	1·93	1·74	6·52
5	0·46	0·43	1·12	1·49	1·35	4·04	1·96	1·72	6·35

Table III indicates the average weight and feed consumption per chicken at the ages of 4, 8 and 10 weeks. These weights may be considered excellent. It is noteworthy that the feed consumption was as high for groups 1 and 2 as for the last three groups, where



Group 3 at the age of 10 weeks.

TABLE IV.—*Health and mortality until the age of 10 weeks.*

	Original number of chickens.	Knuckle walking.	Knuckle walking, percentage.	Mortality percentage.		
				Fourth week.	Eighth week.	Tenth week.
Group 1..........	50	6	12	—	—	—
Group 2..........	50	1	2	—	—	—
Group 3..........	50	2	4	—	—	*
Group 4..........	50	2	4	—	—	—
Group 5..........	50	2	—	—	—	—

the bonemeal percentage was highest. Obviously, therefore, the addition of large quantities of these beans did not detract from the palatability of the rations. Normally, whole beans are not readily consumed by fowls. Not only did the chickens show an excellent increase in weight, but there was not a single case of toe-pecking, feather-eating or cannibalism among them. The growth of the feathers was very fine and their lustre became more intense with an increase in the bean content of the ration in the different groups.

Group 5 at the age of 10 weeks.

During the first three days one chicken died in groups 1, 3 and 4, and two in groups 2 and 5. These chickens were replaced by others which had been kept specially in reserve for the purpose, as it was felt that deaths at such an early age could hardly be ascribed to the ingredients of the ration. During the third week knuckle walking occurred, owing to a deficiency of riboflavin. After the appearance of this nutritional deficiency the chickens were given green feed twice a day and milk to drink for two days. All affected chickens in the various groups recovered immediately and no further cases developed.

Conclusions.

From the above table we draw the following conclusions:—

(1) Undergrade beans may be profitably included in chicken rations if they are available on the farm or obtainable at reasonable prices on the market. The results were good even when the bean percentage in the total ration was as high as 28 percent, but for practical purposes 15 percent of the total ration may consist of undergrade beans.

(2) The deficiency in minerals and amino-acid in bean meal is made good by the other ingredients of the ration.

(3) All the rations used in the experiment were low in riboflavin, and the control seems to have been poorest in this respect. It would appear, therefore, that this deficiency was supplemented to a certain

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Sunn-hemp and Its Uses.

J. J. du Toit, College of Agriculture, Potchefstroom.

SUNN-HEMP (*Crotalaria juncea*) is a tall annual summer legume that is grown mainly for hay, silage, or green-manuring purposes. It does well in most parts of the summer-rainfall area and is a useful stock-feed and soil-renovator. It has several advantages over other hay crops and as a soil renovator it should receive more attention at the present time, when manures and artificial fertiliser are scarce and expensive. Its main uses and characteristics can briefly be summarized as follows:—

The crop is erect in habit of growth, so that it can be cut easily by means of a mower for hay or silage purposes. It is also ploughed under for green manure more easily than the trailing types of legumes generally grown.

Its early rate of growth is rapid. The plants attain a height of three to four feet within six to eight weeks and finally reach a height of five to eight feet within three to three-and-a-half months. It is therefore possible to obtain a fair crop of hay or green manure even when sown late in the season, on account of its rapidity of growth.

Owing to its closeness of planting and its rapid and tall growth it is an excellent crop to smother most kinds of weeds. Moreover, since the crop is generally sown broadcast, it requires no subsequent cultivation and further attention until harvesting time. The best results are naturally obtained on well-prepared, clean lands.

Hardy Crop.

The crop withstands drought to a marked degree, while it also succeeds well under wet conditions, provided the soil does not actually become waterlogged.

In comparison with other legumes it is relatively free from pests and diseases. Its high resistance to eelworm or root-knot disease makes its one of the most useful legumes to rotate with tobacco, potatoes and other crops susceptible to this pest.

It produces an abundance of nitrogenous nodules on its roots and has a beneficial effect on the fertility of soils, even when cut for hay or ensilage. In the case of poor soils under irrigation and the absence of manures it is definitely a most useful green-manuring crop for winter cereals. Wheat farmers in many areas have obtained excellent results with wheat when a summer crop of sunn-hemp had been ploughed in for green manure.

The feeding value of sunn-hemp hay compares very favourably with that of cowpeas and lucerne.

Formerly it was maintained that the hay was not palatable to animals. It has now been shown that when cut in the early bud or the flowering stage and properly cured, the hay is not only palatable to the animals, but is as valuable a feed as cowpea hay, while the yield of hay, under certain conditions, is higher than that from cowpeas. Experiments with pigs and other animals have also shown that there is no danger of poisoning as occurs in the case of certain other crotalaria species.

The crop also has a possibility for fibre-production. In India it is extensively grown for this purpose, and although the fibre is not as suitable for the manufacture of canvas as that of true hemp,* it is used extensively for making cordage. In that country, average yields of 1,200 lb. fibre have been obtained per morgen. In South African sunn-hemp fibre has so far not been produced commercially,

although experiments with it are at present being conducted. In Rhodesia fibre yields of 600 to 800 lb. per morgen have been obtained in experiments.

Citrus and other fruit farmers find sunn-hemp a good cover-crop in orchards where it is easily ploughed under for green manure, in view of its upright habit of growth.

Climatic, Soil and Fertilizer Requirements.

Sunn-hemp prefers a warm climate, but also succeeds fairly well in the cooler highveld area, if grown for hay or ensilage purposes. If seed is to be produced for own use, the crop should be sown early, as it requires a frost-free period of about five months to produce seed on the highveld. Since the crop is usually a shy seeder under highveld conditions, it will be best to leave seed production in the hands of farmers in the lowveld and middleveld areas. The crop is highly drought-resistant and will succeed well under dryland conditions in most areas receiving 20 or more inches of rain per annum.

Any type of soil which is not waterlogged or very infertile is suitable, though best growth will be obtained on the richer soil type, particularly on fertile loams. When grown for fibre it requires a light and not necessarily very rich soil. If grown on too rich soils, the quality of the fibre deteriorates. In general it can be stated that preference should be given to light soils rather than heavy clayey soils.

Like most other crops, sunn-hemp responds well to applications of 200 lb. to 400 lb. superphosphate per morgen. When grown for hay or silage purposes in rotation with maize or other cereals the fertilizer can be applied to the preceding crop and none to the sunn-hemp. The latter will benefit from the residual effect of the fertilizer applied to the previous crop in the rotation.

When grown for green-manuring purposes on irrigable lands, it is best to apply the fertilizer to the sunn-hemp, rather than to the succeeding crop, since greater bulk of green material is then obtained and when ploughed under the phosphates are mobilized largely in organic form for the succeeding crop.

Planting.

The crop can be sown any time from September in the middleveld and lowveld areas and from October in the highveld until December or the beginning of January, whenever moisture conditions are favourable. If grown for green manure, it should be sown as early as possible so that it will reach the proper stage for ploughing under early in autumn. This will allow the incorporated material at least five or six weeks to decompose before the winter crop is sown.

The seed is sown broadcast on a well-prepared fine seed-bed at the rate of about 60 to 70 lb. per morgen for hay or silage purposes. If a seed-drill is available, 40 to 50 lb. is sufficient. After broadcasting the seed it should be worked into the soil, preferably by means of a disc-harrow. A spike-tooth harrow generally does not cover all the seed sufficiently. The seed should be covered to a depth of about 1½ in. to 2 in.

When grown for seed the crop is best drilled in rows 20 to 21 in. apart in which case about 30 to 40 lb. seed per morgen will be required. A maize planter fitted with kaffircorn-plates can be used for planting the rows 42 in. apart and these rows are then straddled by going over the land a second time.

If the crop is to be grown for fibre production, the seed should be broadcast thickly, that is, at the rate of about 150 lb. or more per morgen, so that straight unbranched plants will be obtained.

Harvesting.

When the object is seed production, it is customary to top the plants when they are about 2½ ft. high. This induces branching and the formation of a greater number of flowers, thus increasing the seed yield per morgen.

When the majority of pods are turning yellow and the seeds rattle in the pods, the crop is cut, tied into bundles and stooked in the field. In these stooks the plants are allowed to dry out completely for about two weeks. They are then carted to a suitable threshing floor and the seed is threshed by beating small bundles against a hard object, by trampling with animals, or by means of a wheat threshing machine suitably adjusted. An average yield of seed is about four to eight bags (203 lb.) per morgen.

When cutting the crop for seed, as long a stubble as possible must be left, as this, when ploughed under, will materially benefit the soil while the short tops will pass more readily through a wheat thresher.

For Hay or Silage.

For hay or silage purposes the crop can be cut at a slightly earlier stage, that is, in the budding stage, just before the crop comes into flower. At this stage, the feeding value is the highest and the hay obtained also more palatable to animals. The total yield of hay at this stage will, however, be appreciably less so that the full flowering stage will be more suitable.

For hay the plants, after being cut with a mower, are left to wilt for about a day in the swath, then raked into windrows and after about two days worked into small cocks. In these cocks the material should be allowed to cure and dry out completely for about five to seven days, depending on weather conditions. If the stems should still be moist when placed in a big stack, there will be danger that the material will ferment and become mouldy. On the other hand, the drying process should not be delayed too long, as loss of leaves and bleaching in the sun will be excessive. The stack is made in the same manner as for cowpea hay or other hay crops.

Losses can be reduced considerably by ensiling the green material directly after cutting (at the same stage of growth as for hay). If the material is to be ensiled alone, then about three gallons of molasses, diluted with five or six gallons of water, should be applied systematically to every ton of sunn-hemp. If some green maize or ambercane is available, these can be thoroughly mixed with the sunn-hemp in the ratio of two or three parts of the former to one part of the latter, when the addition of molasses is not necessary.

When sunn-hemp is cut in an advanced stage of growth it cannot be cut successfully by means of a power-driven silage cutter, as the tough fibres tend to clog or jam the cutter. Young plants in the budding or early flowering stage will, however, not cause any trouble. Older plants should be ensiled whole.

From three to six or more tons of hay can be obtained per morgen depending on the soil fertility and moisture conditions. Up to 30 or more tons of green material can be obtained per morgen under favourable conditions for silage or green-manuring purposes.

Green Manure.

Because of its upright habit of growth it can be ploughed under successfully by means of a mould-board plough with good clearance. The crop is best ploughed under when in the late flowering and full green-pod stage, but can also be ploughed under sooner, depending

on the crop to follow and the moisture condition of the soil. It is important to plough under a green-manure crop after a soaking rain or a thorough irrigation even though the crop has not reached the specific stage of growth desired. Since rotting down of the green material takes about six weeks, the succeeding crop should not be sown sooner than this period after the sunn-hemp has been ploughed in.

Sunn-hemp is not yet a well-known crop in many parts of the summer-rainfall area, but in view of its resistance to eelworm and general suitability for hay, silage and green-manuring, it will in future no doubt play a bigger rôle in South African agriculture.

The Cultivation of Kaffir Corn.—

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the pest is more severe, with the result that plants which need not compete with weeds for soil moisture are more resistant to lice. When the stand is so dense as to provide some protection for the lice against wind and weather, the insects will do much greater damage. In the case of lands infested with witch-weed, farmers are advised to plant resistant seed. Addresses of growers of this variety may be obtained from The College of Agriculture, Potchefstroom.

Reaping.

When the grains have reached the hard dough stage, the ears may be cut off with sickles or the entire plant with a cane knife. If the former method is followed the ears are carted on to the threshing floor and left in small heaps to dry. Large heaps are not desirable on account of the danger of mould development. If entire plants are cut down, they should be stacked in cocks to dry. At threshing time the ears are cut off and threshed, and the stalks used for stock feed.

Bean Meal in Chicken Rations.—

[Continued from page 678.

extent, but not sufficiently. Even green feed could not satisfactorily make good the deficiency during the first three weeks, so that it would be advisable to give green feed from the third day. Much of the green feed is wasted on wire netting floors, as the chickens lift the feed out of the hopper and let it fall through the wire netting. Skimmed milk or brewer's yeast will also supplement this shortage of riboflavin, however.

We understand that certain grain merchants have considerable quantities of bean meal available at 8s. 6d. per 100 lb., f.o.r. Johannesburg.

Equitable Distribution of Fertilizers.

(Dr. J. P. van Zyl, Chief, Division of Chemical Services.)

THE increasing consumption of fertilizer and the lack of shipping for its importation have compelled the Controller of Food Supplies to introduce a system of partial rationing in order to ensure a more equitable distribution of the available supplies. A permit system is being instituted and farmers are required to furnish, before the end of December, a statement of their requirements for the next year.

Since last May it has become clear that the demand for fertilizers by farmers, especially in respect of superphosphate, would exceed the available supplies.

The importation of raw materials required for the manufacture of superphosphate, namely rock phosphate and sulphur, is restricted by the lack of shipping facilities. At no time during the present year could rock phosphate be imported in sufficiently large quantities to enable manufacturers to build up reserve stocks.

Although it was possible to determine with a reasonable amount of accuracy what quantities of fertilizers, including phosphates, would be available, it was extremely difficult to form in advance even an approximate estimate of the demand for the rest of the year. Subsequently it became apparent that there had been not only a considerable increase in the demand but that many farmers had begun to place their orders for fertilizers earlier than usual. So great was the demand that manufacturers of fertilizers were compelled to demand a statement from farmers and to ration old customers on a basis of 50 to 80 per cent. of their average consumption during the past year and, for the time being, to refuse orders from new clients.

In spite of this system of rationing, the stage has now been reached where all available supplies have already been allocated to old customers up to 31 October, 1942. Consequently, those persons, both old and new customers, to whom no assignments have yet been made, will be able to obtain their requirements only from such supplies as will become available after the end of October. In view of the fact that certain farmers will require fertilizers before October, the Controller of Food Supplies has requested fertilizer manufacturers to take into account, when making allocations from their supplies, the area for which the fertilizer is required and the crops for which it will be used. In order to assist those farmers to a certain extent before the end of October, he has also asked manufacturers to apply a system of delivery in instalments in the case of all orders which have not yet been executed. Since other farmers will need their fertilizer only after the end of October, it will be possible to assist a greater number of farmers by means of this system which delays the delivery of part of their fertilizer requirements until the latest possible date. The Controller of Food Supplies will, therefore, appreciate the whole-hearted co-operation of farmers in facilitating the effective and equitable distribution of fertilizer.

The Permit System.

Furthermore, with a view to the most satisfactory distribution, the Controller of Food Supplies, after instituting an exhaustive

investigation, has deemed it advisable to introduce absolute control over the supply of fertilizers. Consequently, it has been decided:—

1. That farmers who previously made use of fertilizers and who have again placed their orders with the same manufacturer for the fertilizer which they will require during the present year, will be supplied with 40 per cent. of their average consumption during the years 1940-41.
2. That all new clients requiring fertilizer during 1942 must submit a written application for a permit form to the Chief, Division of Chemical Services, Private Bag, Union Buildings, Pretoria. Upon receipt of the duly completed form at the above address, the necessary permit will be issued according to available supplies and the circumstances rendering desirable the use of fertilizer.
3. That a general permit system will be instituted for the year 1943. In order to ascertain our total requirements for 1943, every farmer in the Union requiring any fertilizer and bonemeal during the year 1943 will be required to submit a statement *before the end of December*, 1942. Special forms will be obtainable for this purpose from magistrates, extension officers, Colleges of Agriculture, co-operative societies and fertilizer manufacturers, *or* from the Chief, Division of Chemical Services, Private Bag, Union Buildings, Pretoria, to whom the statement as well as all correspondence in connection with fertilizers must be addressed.

   Although such statements should reflect every farmer's actual requirements as accurately as possible, farmers will not necessarily be bound to order the exact quantity estimated. Such statements should, therefore, in no wise be regarded as actual orders.
4. That farmers ordering for 1943 will have to obtain a permit, since fertilizer manufacturers will be allowed to execute orders for that year only under the authority of such a permit. Allocations will be made in accordance with the information furnished on the permit form and with due regard to the farmer's actual requirements and the available supplies.

All members of co-operative agricultural societies are expected to submit estimates of their requirements for 1943, as well as applications for permits, through the medium of their co-operative society, and such societies may then, as in the past, place a collective order for fertilizer for their members.

When applying for permits for the purchase of fertilizer for use during 1943, farmers must ensure that the particulars furnished, and the quantities applied for, correspond with their statements submitted before the end of December, 1942, in respect of each particular crop. Where divergencies occur, the differences should be clearly explained. *Farmers who omit to submit statements before the end of December, or who apply during the course of 1943 for larger quantities of fertilizer than those reflected in their statements will be required to furnish very good reasons, before permits are issued to them.*

Crops and Markets

A Statistical and Economic Review of South African Agriculture

by

The Division of Economics and Markets

Vol. 21 OCTOBER 1942 No. 242

CONTENTS

Price Review for August 1942.*

SLAUGHTER CATTLE.—Although supplies decreased somewhat, prices of lower grades everywhere declined to some extent mainly as a result of the unattractiveness of some consignments of Compounds and Medium cattle. Prime classes were scarce, and the eagerness of some buyers to procure good beef caused prices thereof again to rise. Thus ordinary primes on the Johannesburg market were 59s. 2d. per 100 lb. estimated dressed weight *on the hoof* as against 57s. 8d. the previous month, good mediums 53s. 2d. as against 53s. 6d. and compounds 43s. 2d. as against 44s. 3d. On the Durban market mediums declined from 46. 10d. per 100 lb. dressed weight *on the hook* in July, to 45s. 3d. in August, and compounds from 33s. 10d. to 31s. 9d.

Slaughter Sheep.—On the whole, supplies were of satisfactory quality and a reasonable percentage good sheep arrived. The demand was good for all types and qualities and prices rose in general, but especially in the case of prime sheep. Thus prime merinos on the Johannesburg market were 11·1d. per pound estimated dressed weight in August as against 10·3d. in July, and prime cross-breds 10·0d. as against 9·4d. On the Cape Town market prime merinos were 10·6d. as aginst 9·9d the previous month, and prime cross-breds 10·3d. as against 9·9d.

Pigs.—Although the inferior classes in general declined somewhat, that of prime classes showed a rising tendency. Prime as against 17s. 0d. in July, while National Mark Grade I Nos. 2 and and prime baconers 8·6d per lb.

Foodstuffs.—A moderate supply of hay and sweet grass of which the quality was none too attractive, was present and prices remained more or less on the same level as during the previous month, e.g. on the Johannesburg market Cape lucerne hay was 7s. 4d. per 100 lb. and teff hay 5s. 5d. per 100 lb.

Potatoes.—Large supplies of poor quality were still presert on all markets and prices in general declined. Fresh potatoes of good

* All prices are averages.

quality, however, were scarce and realised good prices, thus Transvaal No. 1 on the Johannesburg market was 14s. 7d. per bag in August as against 17s. 0d. in July, while National Mark Grade 1 No. 2 and 3 were 21s. 4d. and 22s. 6d. per bag respectively as against 21s. 0d. and 22s. 3d. per bag the previous month.

Onions.—Supplies were fairly moderate as it was near the end of the Cape season. Prices rose, e.g. Cape onions on the Johannesburg market rose from 14s. 10d. per bag to 15s. 4d. in August, and on the Cape Town market from 12s. 10d. to 12s. 11d.

Vegetables.—Large supplies from the Transvaal lowveld were present on all markets, although supplies of local production also began to increase. Prices of most kinds declined. Cabbage, cauliflower, carrots and green peas were exceptionally cheap. Squashes and marrows, however, were scarce and realized good prices.

Tomatoes.—Large consignments of Transvaal tomatoes again arrived on all markets, and at times some markets were glutted with the result that sharp declines in prices occurred, e.g. on the Cape Town market tomatoes in trays declined from 1s. 11d. to 1s. 7d. in August and on the Durban market from 1s. 1d. to 7d. On the whole, however, good quality realized satisfactory prices, e.g. N.M. No. 1 on the Johannesburg market was 2s. 5d. per tray in August.

Fruit.—The supply consisted mainly of citrus fruit, and especially an increase in Valencia oranges was noticed. The exceptionally firm price level of last month was maintained. Prices of Naval oranges on the Johannesburg, Cape Town and Durban markets were respectively 2s. 8d., 3s. and 3s. 6d. per pocket, while Valencia oranges were 2s. 3d. per pocket on the Johannesburg and 2s. 4d. per pocket on the Cape Town and Durban markets. With regard to tropical fruit, paw-paws were present in exceptionally large supplies, while pineapples were also well supplied.

Eggs.—The laying season was still in full swing, and larger supplies forthcoming. Prices again declined, e.g. new laid eggs on the Johannesburg market from 1s. 8d. per dozen in July to 1s. 2d. in August and on the Durban market from 2s. to 1s. 2d. per dozen.

Review of the Slaughter Stock Position.

An outstanding characteristic of the slaugther-stock industry during the past few years has been the excessive increase in the demand for meat as a result of war conditions. This increase is clearly reflected by the following figures of animals slaughtered at municipal abattoirs in the Union:—

Animals Slaughtered at Municipal Abattoirs.

	Cattle.	*Sheep.*
1940	721,000	3,870,000
1941	806,000	4,432,000
1942	860,000	4,804,000

(Figures compiled from levy returns and furnished by the Livestock and Meat Control Board.

The figure for 1942 has been interpolated from slaughterings during the first six months of this year and from that of the previous year).

It appears that during the two years there was an increase in price of approximately 20 per cent. and in the case of cattle and approximately 20 per cent. in the case of sheep slaughtered.

In view of this sudden increase in the demand, and the fact that the production of slaughter stock not only failed to keep pace with that demand, but was also hampered by the severe drought during the past eighteen months, it was only natural that a relative shortage should occur. Indeed, at the present rate of consumption we are running the risk of depleting our breeding stock.

This relative shortage has caused prices of all classes of slaughter stock to rise to an unprecedented high level. Ordinary primes on the Johannesburg market for example, averaged 39s. per 100 lb. estimated dressed weight on the hoof, in 1938-39 and 52s. in 1941-42. Compounds were 41s. 7d. as against an average of 38s. 4d. in 1941-42. On the Durban market medium cattle per 100 lb. dressed weight on the hook averaged 36s. 3d. in the year before the war and 40s. 3d. in 1941-42, while compounds were 27s. 4d. and 30s. 9d. per 100 lb. respectively.

In the case of slaughter sheep, prime merinos on the Johannesburg market advanced from 6·3d. per lb. estimated dressed weight, on the hoof, in 1938-39 to 8·3d. per lb. in 1941-42; and prime crossbreds from 5·8d. to 7·5d. per lb. On the Cape Town market prime merinos rose from 5·8d. per lb. to 7·7d., and prime crossbreds from 5·9d. to 7·6d. per lb. This advance is still continuing, so that in August 1942 new peaks were realized in the case of sheep, while everything points to the fact that under these circumstances the prices of slaughter cattle will also reach further record levels towards the end of this year and the beginning of next year.

Producers did everything possible in order to meet this increased demand. Particular mention must also be made here of the considerable increase in the practice of feeding stock. Proof of this is the fact that increasing quantities of maize are being retained on farms according to estimates made by the Maize Control Board.

At the same time the Department and the Livestock and Meat Industries Control Board have been doing everything in their power to ease the position. In addition to the regulation of supplies of cattle to the Johannesburg and Cape Town markets over the different days of the week in order to assure an even distribution, the Board has also been granting all permits applied for from the Union.

As regards cattle from adjoinning territories, South-west Africa has free access to Union markets, while the weight embargo on cattle from Bechuanaland to the controlled markets has been suspended and subsequently also in respect of Swaziland cattle to the Durban market. At the same time the maximum quotas to these markets were at first greatly increased and subsequently entirely waived, so that cattle from these areas now have free access to the controlled markets of the Union and Swaziland cattle to the Durban market.

Apart from these measures, the purchasing section of the Food Control scheme is to-day also contributing largely towards easing the position by undertaking the purchasing for a number of important military camps. This purchasing organization has been functioning since April of this year and through its judicious action it has undoubtedly stabilized the position in the interest of both consumer and producer.

Index of Prices of Field Crops and Animal Products.

The index did not change much since July. A slight decline set in, viz. from 157 in July to 154 in August.

The most important price declines occurred in

(a) the group "Poulty and Poultry Products", viz. from 163 in July to 130 in August, caused by a further drop in prices of eggs;

(b) in the group "Other field crops", viz. from 184 to 175 in August, caused by a drop in potato prices. The other groups changed little or nothing.

Seed Maize.

In terms of regulations issued under War Measure No. 20 of 1942, no producer is allowed to sell maize except to a trader designated by the "Mealie Industry Control Board". This measure has now been amended by Regulation No. 1837 of 11 September, 1942, with a view to facilitating the purchase of seed maize. This amendment allows a producer to sell seed maize to another producer (farmer) at a minimum price of 19s. 6d. per bag, provided he obtains a permit from the "Mealie Industry Control Board." The buyer of seed maize requires no permit if he wants to buy only 10 bags or less before 1 October, 1942. After 1 October under regulation No. 1852 in the Gazette Extraordinary of 11 September 1942, he may buy only 5 bags or less without a permit. If a buyer wishes to purchase more than 10 bags of seed maize (and more than 5 bags after 1 October), he must first obtain a permit from the "Mealie Industry Control Board" for the number of bags in excess of the above figures.

Since there are no grades for seed maize and since good seed maize is much more expensive than the ordinary maize offered for consumption, a minimum price of 17s. 6d. per bag has in this case been fixed by Regulation No. 1835 of 11 September, 1942.

(Controller of Food Supplies.)

FARMING IN SOUTH ... AFRICA

Vol. 17 NOVEMBER 1942 No. 200

Editorial:

The Danger of High Prices.

THE world is out of joint—and so, too, is the economic life to which we have accustomed ourselves during the four or five years preceding the war. Yet, the direct effect of the war on our country and on our lives has not been so apparent as in many other countries. It is probably necessary, therefore, to remind people at intervals that we are living in abnormal times and that the economic uncertainties which beset farming (apart from the ever-present vagaries of the weather) have been considerably aggravated. Superficially it may appear as if the market value of many of our most important farming products is surely and consistently rising. Every producer will agree that it is pleasant to receive ever-increasing prices for the wares he produces and offers for sale. But this advantage may equally well be of a temporary nature and may even be deceptive. If I have to pay 30 per cent. more for implements, fertilizer and concentrates than I did three years ago, and receive only 20 per cent. more for my products, it is probable that I will be economically worse off than I was when the market prices stood at a lower level; especially if the price of such necessaries of my house and family, as must be bought, has increased out of proportion to even the foregoing. We all know that both import and export have been hampered by the present shortage of shipping space. It is already becoming very difficult to replace machinery and farming implements and to import building material, sacking and fertilizer in liberal quantities. It will, therefore, for the time being, be necessary to guard with great care against any wasteful use of these articles. It is possible that they will not only become very expensive but almost unobtainable. The farmer should learn to leave much less room for speculation in the organization of his farming enterprise than he probably used to do in the past. The producer of milk, eggs and pork should rely less on purchased (partly imported) protein-rich concentrates and try to produce more himself. In producing for the market, he should take into account the immediate requirements of our own country rather than rely on the possibilties of a favourable export market. And if abnormal immediate circumstances create a heavy local demand—with consequent increased prices—he should not specialize exclusively in that direction; he should be particularly careful not to rush into heavy capital outlay or, possibly, pay high prices for land in proportion to the incidental high prices of products, and must, *above all, avoid incurring debt for such land*. Uninvested cash should rather be used to pay bonds; in that way landowners will increase their *owned* capital to better advantage and possibly at a lower cost per morgen than they would have to pay for additional land. And one thing farmers must always remember: whether the market price is high or low, for his own domestic use and for the welfare of his dependants, a pound of butter or a bag of potatoes or a joint of meat or a basketful of vegetables or fruit will always retain their same real value in use. During times of uncertain prices and supplies, every essential article which you can produce or make yourself is a source of security and self-reliance.

(Dr. J. F. W. Grosskopf, Director of Marketing and Distribution, Food-Control Organization.)

Diseases which may be Mistaken for Lamsiekte.

S. J. van der Walt and Dr. Douw G. Steyn, Onderstepoort.

LAMSIEKTE, also called lamgalsiekte or gallamsiekte, is usually caused by eating carcasses infected with the bacteria of this disease. It must be remembered that lamsiekte can occur in different forms according to the quantity of lamsiekte poison (botulinus toxin) ingested by the animal together with infected rotten meat or bones. It is possible, therefore, that animals may suddenly die of lamsiekte

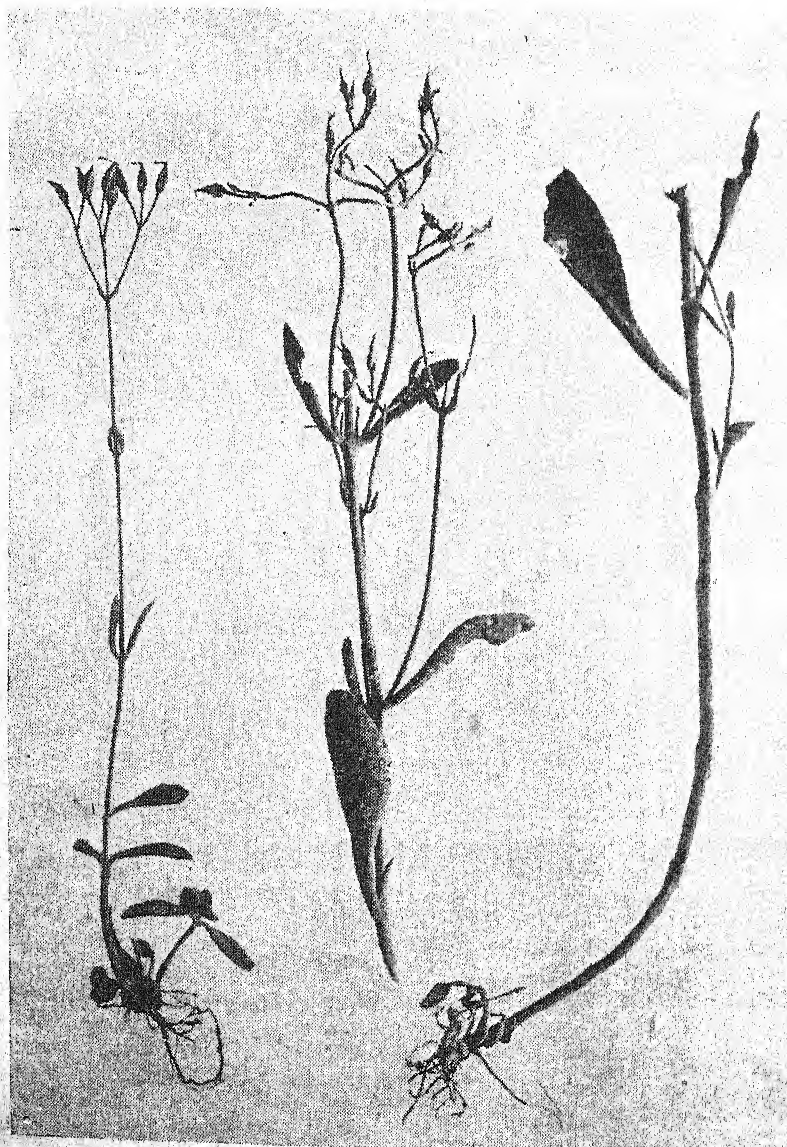


FIG. 1.—*Kalanchoë rotundifolia* Harv., which grows to a height of approximately 12 to 18 inches.

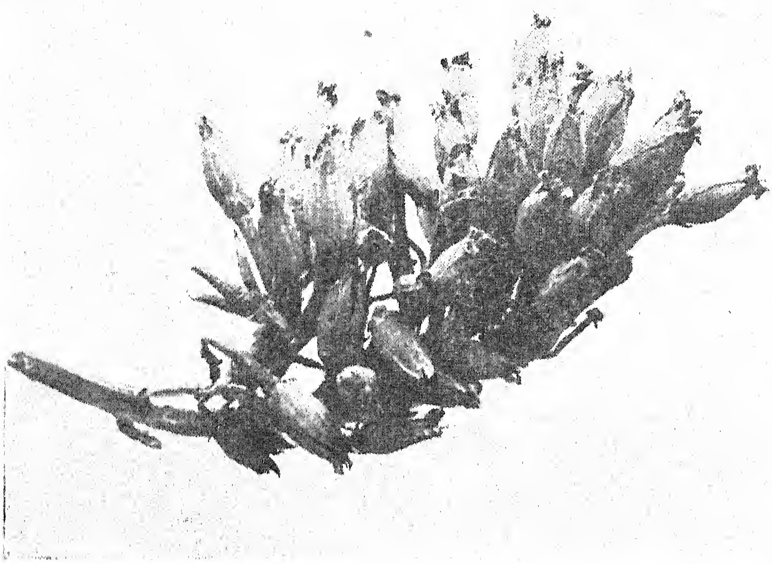


FIG. 2.—Flowers of *Kalanchoë thyrsiflora*.

without exhibiting any of the usual symptoms of paralysis. If smaller quantities of the toxin have been taken, we know that the animals may remain paralysed and unable to rise for weeks. It is this last-mentioned form of lamsiekte, viz., the paralytic form, which will be discussed here since there are other diseases which also cause paralysis.

In a previous article in *Farming in South Africa* (November, 1940), it was explained that symptoms of paralysis may also occur in the case of arsenic, tulip and slangkop poisoning. Even in the case of common dry gallsickness in cattle (*Farming in South Africa*, July, 1940) a very noticeable paralysis, especially of the hindquarters, may occur. Cases of prolonged (chronic) lead poisoning may also resemble lamsiekte; in both cases constipation and partial or total paralysis occur. Paralysis may further occur in cases of mineral (copper, calcium, iron, etc.), and vitamin deficiency, and may also be due to abscesses in the spinal canal (*Farming in South Africa*, November, 1940). It should also be mentioned that paralysis in pigs is usually caused by swine fever (*Farming in South Africa*, August, 1936). Reprints of these articles are obtainable from the Director of Veterinary Services, P.O. Onderstepoort.

Poisonous Plants and Paralysis.

In this article, the attention will be drawn to cases of paralysis which are very similar to lamsiekte but are caused by poisonous plants. It has been known for a considerable time now that in cases of protracted " krimpsiekte ", caused by the " krimpsiektebossie " or " plakkies " (*Farming in South Africa*, July, 1939), and by the creeper " Dawidjies " (*Cynanchum* species) the affected cattle or sheep remain paralysed for weeks, thus making an erroneous diagnosis of lamsiekte possible.

During the past few years, three more varieties of " plakkies ", viz,. *Kalanchoë paniculata* Harv., *Kalanchoë rotundifolia* Harv., and

Kalanchoë thyrsiflora Harv. have been discovered, which can also in certain circumstances, cause paralysis very similar to that of lamsiekte. The matter is further complicated by the common occurrence of the two first-mentioned species *Kalanchoë* in certain areas where lamsiekte is also prevalent (viz., portions of South-West Africa, the Western Transvaal and Griqualand West). Some years ago, Mr. J. F. de Villiers, Klipdam, Griqualand West, sent us these two species of *Kalanchoë* to test and it was then found that there was a resemblance between lamsiekte and cases of poisoning by these plants. A few months ago, Mr. Montgomery of Stella, Windhoek, S.W.A., also notified us that he was experiencing the same trouble on his farm from lamsiekte and poisoning by these two plants.

The toxic principle present in the *Kalanchoë* species is the same as that found in the poisonous " plakkies ", viz., *Cotyledon* toxin, but the former contain a further unknown toxin which acts as a severe irritant of the mucous membrane of the stomach and intestines. The symptoms caused by the *Kalanchoë* species, therefore, depend on the ratio in which these two toxins are present. If there is a large quantity of *cotyledon* toxin present, cramp followed by paralysis (symptoms found in lamsiekte) will occur; otherwise other symptoms, such as bloating and even haemorrhagic diarrhoea will appear. The flowers of the *Kalanchoë* species are much more poisonous than their leaves. The leaves of these plants are thick, and have a high water content like those of the *Cotyledon* species (" plakkies " and " krimpsiektebossie "). They also belong to the same family, viz., *Crassulaceae.*

Treatment for Paralysis.

Treatment of cases of paralysis, especially of lamsiekte, has not yet yielded any very promising results. Strychnine and strong black coffee must be used as prescribed in *Farming in South Africa*, of August, 1941.

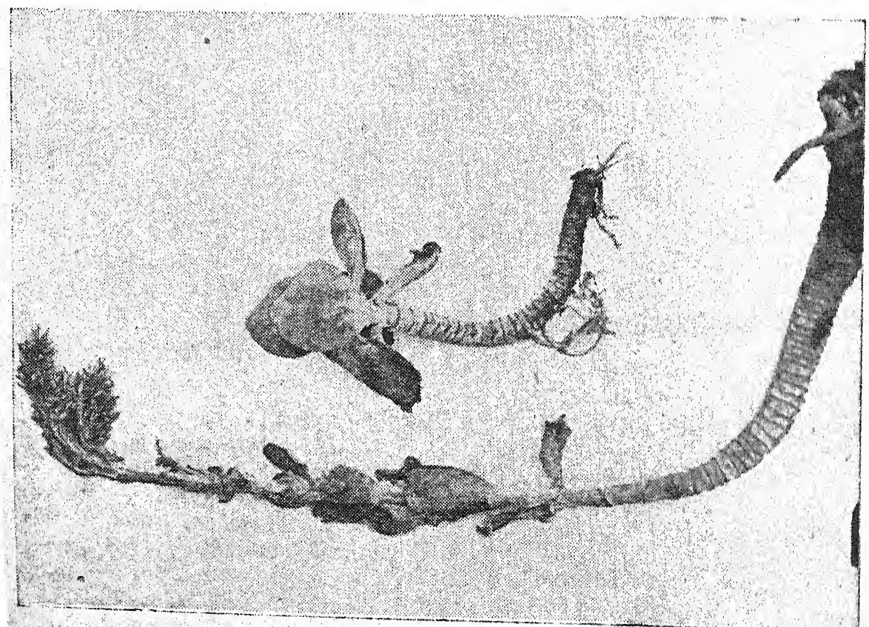


FIG. 3.—*Kalanchoë Thyrsiflora* Harv., which grows to a height of approximately three to five feet.

Municipal Compost.

J. P. J. van Vuren, Extension Officer, Ficksburg.

FOR many years now South Africa has been pouring the fertility of her soil into the cities. Every day thousands of tons of farm products in the form of meat, eggs, maize, wheat, vegetables, fruit and other products, are sent from the farms to feed the urban population of the country, but not the slightest effort is ever made to restore any part of all this to the soil which has been responsible for the

Process of Compost-making from Municipal Refuse: Pits and Drying Shed.

production of these articles. In the cities the major portion of this potential fertility goes up in smoke or disappears down the drains instead of being converted into useful fertilizers and restored to the impoverished soil. It is not surprising, therefore, that in spite of the short period during which agriculture has been practised in this country, our soils are already beginning to reveal the harmful results of this malpractice which has not only resulted in the deterioration of our soils but is already beginning to affect the health of the community. The health of a nation can be maintained only if wholesome food, produced on sound fertile soil, is available.

Conversion of Municipal Refuse.

About three years ago a beginning was made in Ficksburg, O.F.S., in co-operation with the local municipality, with the conversion of all refuse, including night soil, found in the municipal area, into compost—a product which can be effectively utilized to restore the lost soil fertility. The compost-making process applied in Ficksburg is based on work done in India during the past few decades by Howard, Watson and Wadd. The scheme was such a success at Ficksburg that it has, in the present circumstances, assumed national importance since the adoption of similar schemes by all the cities and towns in the country would mean that the fertilizer problem would be largely solved. In addition, the demand for Karroo manure has recently been so great that it may be assumed that supplies will not be available indefinitely. In view of this and

the possibilities offered by the preparation of compost by municipalities, on a nation-wide scale as well as the danger of further restrictions on the importation of fertilizers in the near future, the Department of Agriculture and Forestry has decided to launch a campaign for the increased production of compost to be made available for agricultural purposes.

In order to carry this nation-wide campaign into effect, the Union has been divided into 6 areas: Mr. U. W. Schmidt, of the Division of Chemical Services, Pretoria, is responsible for the northern Transvaal, and Dr. N. J. Viljoen, of the College of Agriculture, Potchefstroom, for the southern Transvaal; Mr. L. L. Eksteen, of the College of Agriculture, Glen, for the Orange Free State; Mr. J. G. Brevis, of the College of Agriculture, Cedara, for Natal; Mr. H. A. J. Stead, of the Grootfontein College of Agriculture, for the area served by this college, and Mr. I. S. Perold, of the Stellenbosch-Elsenburg College of Agriculture of the University of Stellenbosch, for the western Cape Province. These persons will keep in touch with the municipalities in their respective areas, supply the necessary technical advice and inspect all the work done.

Judging from the interest shown by municipalities since the scheme became known, there is every reason to believe that it will meet with general approval since such a scheme offers not only financial advantages for the municipalities concerned but also far-reaching possibilities from a hygienic point of view. The officials who have been entrusted with these special duties have already commenced with the immediate application of the scheme by the municipalities in their areas. Since the provincial municipal congresses are to be held between now and the end of the year, arrangements have been made to address the congresses on this matter. At the conclusion of each congress a two-day course will be conducted for municipal health officers of the province to enable these persons, who will be mainly responsible for the application of the scheme in their respective towns, to gain a sound knowledge of the process and what it involves.

Use of Compost.

Regarding the value of municipal compost as fertilizer, it should be clearly pointed out here that it is by no means the intention that compost should supersede artificial fertilizers. Compost is an organic fertilizer and may be regarded as equivalent to natural fertilizers such as kraal and Karroo manure. In the case of irrigated land, especially, the application of compost will be of the utmost importance for keeping the soil structure in good physical condition. Irrigation farmers who receive high prices for such products as vegetables, tobacco, potatoes and other crops which require large quantities of organic material, will find it profitable to apply municipal compost at the rate of as much as ten or twenty tons per morgen, even if they have to buy the compost at a price equivalent to the present price of unground Karroo manure. The dryland farmers, on the other hand, whose income per morgen is not only relatively low but in many cases also uncertain, will, from an economic point of view, not be able to apply very large quantities of compost since the cost of fertilizer per morgen will then be prohibitive. In the past, this type of farmer used to apply ground Karroo manure, with or without the addition of phosphates, by means of fertilizer distributor appliances. It is very doubtful whether profitable results can be expected from this method of application since the quantity of Karroo manure applied in this

[Continued on page 718.

Use of Waste Tobacco in Dips.

P. M. Bekker, Division of Veterinary Services, Onderstepoort.

EARLY in 1940, the Division of Veterinary Services was notified that a serious problem had arisen in the East London district where it was found that the farmers were no longer able to kill the blue tick, *Boophilus decoloratus*, by the application of the usual control measures, viz., dipping infected cattle in arsenical dips.

It can be mentioned here that the blue tick, owing to the fact that the parasitic phase of its life cycle must be spent on a host where

A cow severely infested with ticks.

The same cow 10 weeks later.

it has to remain for an average period of 23 days, has hitherto always been regarded as the one type of tick which can be controlled most readily by means of dipping.

Apparent Ineffectiveness of Arsenical Dips Against the Blue Tick.

Before the matter was referred to Onderstepoort for further investigation, the local veterinary staff did their utmost to determine whether the powers of resistance of the blue tick were an actual fact or whether it was just the result of insufficient dipping, etc. Investigations revealed that the difficulty of controlling the blue tick had been experienced since May, 1937, on a certain farm 25 miles from East London (near Berlin) and that during March, 1938, similar difficulties were experienced as far away as the Komgha district. Careful supervision of dipping on a series of selected farms in this area soon confirmed the opinion that the blue tick did show a high degree of resistance against arsenite of soda dips in general (in the form of salts or in prepared form such as the various patent dips).

An extensive series of experiments under field conditions was started by the Division of Veterinary Services in which different

substances were tested out in dipping tanks in this area. The experiments extended over a period of one year, during which time the ticks were also studied from every aspect, with the result that the original opinion of the farmers as well as that of the local veterinary staff was confirmed. The conclusion arrived at was that, without any change in external appearance or in its life cycle or in its habits, there had developed in a relatively limited portion of the eastern Cape Province a strain of blue tick which could not be controlled by means of arsenical dips.

Addition of Tobacco Extract Necessary.

The above-mentioned experiments showed that the only efficient method of control was the regular dipping of cattle at intervals of 7 days in an arsenical dip of 7-day strength, i.e., 0·16 per cent. As_2O_3 to which tobacco extract or nicotine at a concentration of 0·04 per cent. had been added. Even then there will be cases where the animals will be altogether free from the resistant blue tick only after the seventh dipping.

The accompanying illustrations were taken of—

(1) a cow which was dipped regularly in a 0·16 per cent. As_2O_3 concentration of arsenical dip. The cow has a white udder so thickly covered with small ticks that it appears to be black;

(2) the same cow after she had been dipped for about 10 weeks in the recommended arsenic-nicotine mixture. On this photograph the cow's udder, now freed of ticks, appears white.

As a result of the scarcity and exceptionally high prices of nicotine sulphate (40 per cent. nicotine) the *question arose as to the extent to which use could be made of the nicotine in waste tobacco.* Experiments with this aim in view were carried out and are described below.

Methods of Control.

(i) *Use of nicotine sulphate containing* 40 *per cent. nicotine.*—Nicotine sulphate is placed on the market in 10 lb. tins and has a specific gravity of 1·137, i.e., 1 gallon would weigh approximately 11·37 lb. The 10-lb. tin would, therefore, contain approximately 7 pints and not a full gallon. The fact that it contains 40 per cent. nicotine means that 100 parts, by weight, would contain 40 parts nicotine. A 0·04 per cent. concentration will, therefore, be obtained if the contents of one 10-lb. tin are added to 1,000 gallons of water. The quality of certain types of water makes it necessary to add more nicotine in order to get the desired strength.

The following recommendations are, therefore, made:—

When fresh dip is prepared, one 10-lb. tin of 40 per cent. nicotine is added for every 800 gallons of water in the tank. The nicotine can also be added to the ordinary 0·16 per cent. As_2O_3 (7-day strength) or, if the tank is too dirty, it can be cleaned and filled afresh, in which case 2 lb. arsenite of soda (dissolved in hot water) should be added for every 100 gallons of water in the tank. The nicotine should then be added in the above-mentioned ratio.

When dip is added, 1 pint of nicotine must be used for every 2 lbs. arsenite of soda added (i.e., for every 100 gallons of water). This will compensate for the natural decrease in strength as well as for the quality of the water.

If the nicotine concentration is 80 per cent., the dilution when mixing fresh dip will naturally be 1 in 1,600, and when arsenite of

soda is added the quantity will be half a pint to every 100 gallons of water for 2 lbs. arsenite of soda.

(ii) *Use of waste tobacco in dipping tanks.*—As is well known, the 40 per cent. nicotine is also manufactured from tobacco and especially from waste tobacco. This nicotine in waste tobacco can, by a very simple and economic method of leaching or lixiviation, be utilized in dipping tanks.

The principle on which this method of extraction is based, is the following:—

The nicotine is lixiviated by simply suspending the tobacco in bags in the tank in such a way that they are submerged under the dipping fluid containing 0·16 per cent. As_2O_3 (7-day strength). A gradual process of lixiviation then takes place. If the bags are moved from time to time, the fluid inside them will more easily be mixed with the rest of the fluid in the tank. After this has been continued long enough, the bags are taken out, thoroughly rinsed in water and removed. The process of lixiviation, takes place automatically without any expense or loss of nicotine and requires a minimum of labour.

One method of lixiviation which is generally favoured by farmers is that of boiling the tobacco to extract the nicotine. This method cannot, however, be recommended at all, and must, in fact, be strongly condemned, since a considerable portion of the nicotine is lost if this method is adopted.

Amount of Waste Tobacco Required in a Dipping Tank.

In determining the amount required, the nicotine content of the tobacco must be known. In order to obtain an answer to this question, samples of waste tobacco were obtained from all over South Africa and an analysis showed that differences did exist. Out of 10 samples there was one with a 0·8 per cent., one with a 4·1 per cent., the average being 2·68 per cent. nicotine content. On the whole it may be assumed that a concentration of approximately 2·5 per cent. nicotine will be obtained.

If farmers grow their own tobacco for this purpose, it is desirable to break up the leaves in pieces of about ½ inch to one inch square. The hard portions and the stalks contain so little nicotine that their use can definitely not be recommended.

The following table gives particulars of the corresponding quantities of tobacco of varying nicotine content which should be used when making fresh dip and when adding to the dip in a tank. The quantities are, of course, taken in such a manner as to correspond with the dilution for 40 per cent. nicotine, viz., for a fresh filling a dilution of 1 to 800, and when adding to the dip, 1 pint for every 100 gallons of water and 2 lbs. arsenite of soda added.

	A. Nicotine in waste tobacco.	B. Fresh dip. Quantity of water for 100 lb. tobacco.	C. Addition. Quantity of tobacco for every 100 gallons of water.
	%	Gallons.	lbs.
1.....	1	200	57
2.....	1½	300	38
3.....	2	400	29
4.....	2½	500	23
5.....	3	600	19
6.....	3½	700	16
7.....	4	800	14

Mixing the Dip.

Assuming that the nicotine content of the tobacco has been determined at $2\frac{1}{2}$ per cent. (column A, No. 4) then the corresponding figure in column B indicates that 100 lbs. of that type of tobacco is necessary for every 500 gallons of dipping fluid in the tank. If the dipping fluid is to be freshly mixed or is dirty, it should in any case contain 0·16 per cent. As_2O_3, i.e., 2 lbs. arsenite of soda per 100 gallons, before the tobacco is suspended in it. Nicotine is stable in the presence of arsenic in the tank but is attacked by bacteria and destroyed if no arsenic is present.

When adding to the dipping fluid the corresponding figure in column C indicates that 23 lbs. of tobacco must be leached for every 100 gallons of water and 2 lbs. arsenite of soda added.

The ratios shown above, as in the case where 40 per cent. nicotine is used, allow for the quality of the water and for the natural decrease in the strength of the concentration.

For the process of leaching, the required amount of tobacco is placed in the bags, which contain stones or weights heavy enough to keep them submerged. (A stone weighing about 75 lbs. will be heavy enough for approximately 50 lbs. tobacco.) On no account must the bag be more than half full since the tobacco swells on becoming wet. If the bag is too full, the circulation of the fluid both inside and around the bag is obstructed, resulting in a weakening of the entire process of leaching.

The weight of a groundnut bag full of tobacco is 100 lbs. while that of an ordinary grain bag is only 50 lbs. If a groundnut bag (in which the crumbled tobacco is usually sold) is used, it should not contain more than 50 lbs. of tobacco while a grain bag should contain only 25 lbs.

The opening of the bag should be laced up with smooth galvanized wire the ends of which should be fastened to a pole placed across the tank so that the bag is just submerged in the dipping fluid. The bags with tobacco should not be put in immediately after dipping but the day after, so as to allow the dirt in the tank to settle, otherwise this dirt will form a deposit on the outside of the bag and hamper the process of leaching.

The bags can be left hanging in the tank for three to five days. During this time the bags must be vigorously moved up and down, say three times a day, in order to allow the more concentrated nicotine solution to flow out.

When the bags are removed from the dipping tank, they should be laid on the draining floor so that the liquid can flow back from the bags into the tank. The bags are then opened and thoroughly rinsed with water; about half a gallon for every lb. of tobacco in the bag is sufficient. If this process is carefully carried out according to instructions, not more than 0·2 per cent. of the nicotine will remain in the tobacco. This loss is due to the moisture remaining in the tobacco. The dipping mixture will then be ready for use.

Effect on Eyes.—It is noticeable than when animals are dipped in this fluid their eyes smart, as is indeed also the case when 40 per cent. nicotine is used. This effect is an advantage rather than a disadvantage and if the farmers see to it that their draining enclosures are strong and well-built—no difficulty will be experienced. There is reason to believe that the presence of nicotine in the dipping fluid actually helps to prevent sore eyes. This cannot be confirmed, however, before the investigation has been concluded.

Effect on milk production.—The addition of nicotine does not appear to accentuate the usual effect of arsenical dip on milk

[*Continued on page 714.*

Ticks and Tick-borne Diseases.

R. du Toit, Veterinary Research Officer, Onderstepoort.

Part II.

THE first part of this article (*Farming in South Africa*, September, 1942) dealt with a general discussion of ticks, a rough outline of their classification and their importance. The necessity for accurate identification of species was stressed on account of the varying life histories and habits, calling for special methods of control and a description of the families *Argasidae* and *Ixodidae* followed. The more important argasid ticks were discussed in greater detail together with two species of harmful ixodid ticks, not however, associated with the transmission of disease, and it is now intended to continue with the more important species of the *Ixodidae* and their relation to disease. In the concluding part the eradication and control of ticks and tick-borne diseases are dealt with.

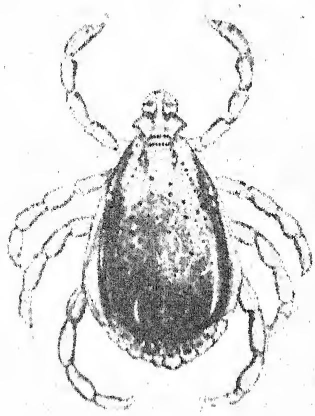


FIG. 6.—The Dog Tick (Male). Magnified 7 times.

The Dog Tick.

The dog tick (*Haemaphysalis leachii*, Audouin), Figs. 6 and 7, is a small light brown species which is easily recognised by its short mouth parts, the palps of which are triangular in shape, the absence of eyes and the absence of adanal plates or shields towards the back of the undersurface of the males. The engorged females are roughly ¼ to ⅜ inch in length, greyish blue in colour, with the characteristic short triangular mouth parts and when lifted from their sites of attachment often disclose the presence of a male situated underneath them.

Distribution.—This species is widely distributed throughout Africa and is common in South Africa, where it is essentially a parasite of dogs and cats and wild animals of the dog and cat tribes. In some districts of the Cape Province, particularly Oudtshoorn, its place, as the principal dog tick, is to some extent taken by the russet or paralysis tick, whereas in the Zoutpansberg district of the Transvaal the tropical dog tick (*Rhipicephalus sanguineus*), to be described later, often supersedes it

Life History.—The dog tick is a three-host tick, the larvae and nymphae both dropping from the

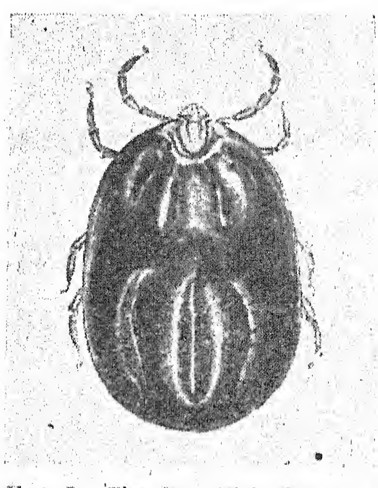


FIG. 7.—The Dog Tick (Engorged Female). Magnified 4 times.

host to moult on the ground. The female after engorging, which takes 5 to 6 days, drops to the ground where, after about 3 to 7 days, depending upon climatic conditions, she lays on an average about 5,000 eggs and dies. The eggs hatch after about one month and the larvae feed for a period of from 2 to 7 days when they drop from their host and moult to the nymphal stage. The nymphs engorge in from 2 to 7 days, drop and moult to adults in about two weeks. The males may remain attached to their hosts for long periods after the females have dropped and, as is characteristic for the males of the *Ixodidae* in general, where the hard outer covering allows of little expansion, take very little blood.

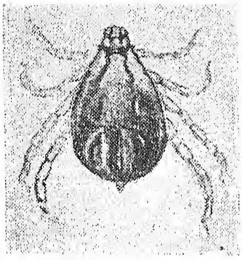


FIG. 8.—The Blue Tick (Male). Magnified 7 times.

Relation to Disease.—This tick is the chief transmitting agent of the highly fatal biliary fever or piroplasmosis of dogs in South Africa caused by *Piroplasma canis*, a blood parasite specific to dogs and jackals. The infection is derived by females from infected dogs and passes through the egg stage to the next generation, where neither the larva or nymph is capable of transmitting it but only the adults. A somewhat similar disease of cats caused by the blood parasite *Nuttallia felis* is probably also dependent upon this tick for its transmission. The larvae are capable of transmitting tick-bite fever to man.

The Transkei Cattle Tick (*Haemaphysalis silacea,* Robinson)

It is a related species which occurs principally on cattle and is rather rare and confined to a few districts in the south-eastern Cape Province. It may be distinguished from the foregoing by the shape of the mouth parts which, though short, do not show the triangular appearance characteristic of the dog tick. One other species of this genus (*Haemaphysalis aciculifer* Warburton), has been recorded principally from cattle on the eastern slopes of the Drakensberg in the Pilgrims Rest district of the Transvaal, in which the palus show a tendency towards being triangular in shape and the male is provided with a long pointed spur on the 4th coxa or basal portion of the fourth leg. These two species have not been shown to be associated with the transmission of disease to livestock.

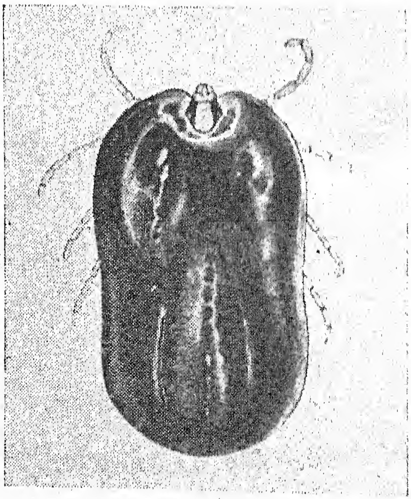


FIG. 9.—The Blue Tick (Engorged Female). Magnified 5 times.

The Blue Tick.

This tick (*Boophilus decoloratus,* Koch), Figs. 8 and 9, is one of the commonest species in the Union although it is rare in Zululand and does not occur in some of the very arid regions. It occurs all over the heads, necks and bodies of cattle and horses but is found more rarely on sheep, goats and dogs.

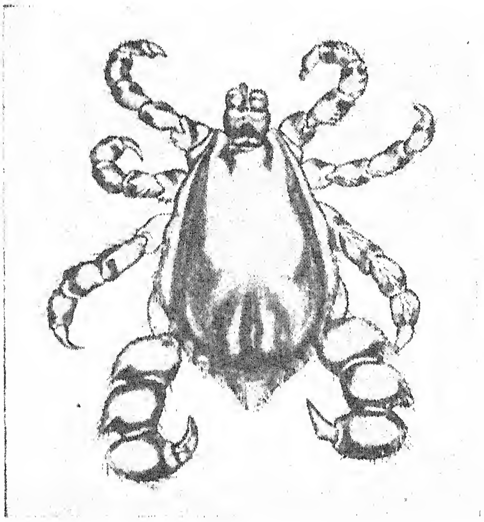


FIG. 10.—The Argentine Tick (Male).

Description.—This species is characterised by the possession of very short mouth parts and pale yellow legs. The males are small, roughly $\frac{1}{8}$ inch in length, pale brownish yellow in colour and are generally to be found attached to the skin underneath the females. Eyes are present and the areas surrounding them are generally slightly reddish or brownish, particularly in the female. The male is further characterised by the presence of strongly pointed adanal shields on the lower surface and also a pair of accessory adanal shields on either side, and the body ends posteriorly in a short though distinct tail or median pointed prolongation. The female when engorged is bluish in colour, elongated, with frequently a slight constriction about the middle giving it a characteristic appearance, and is roughly $\frac{1}{2}$ inch in length.

Life History.—One host only is required for the completion of the parasitic stage, the larvae attaching themselves to the skin where, after engorgement, they moult to nymphs which in turn moult to adults without any material change of position. The complete life cycle on the animal occupies a period of from 22 to 38 days, depending upon the season of the year and the average period between the attachment of the larvae. The appearance of the first engorged adult females is 23 days. After engorgement the female drops from the host and egg laying, which comprises from 1,000 to 2,500 eggs, commences after approximately six days. The eggs hatch in about 6 weeks time giving rise to minute six-legged larvae, which crawl about actively in search of a host. These larvae have been kept alive without food for six months but will normally not survive for more than 3 months.

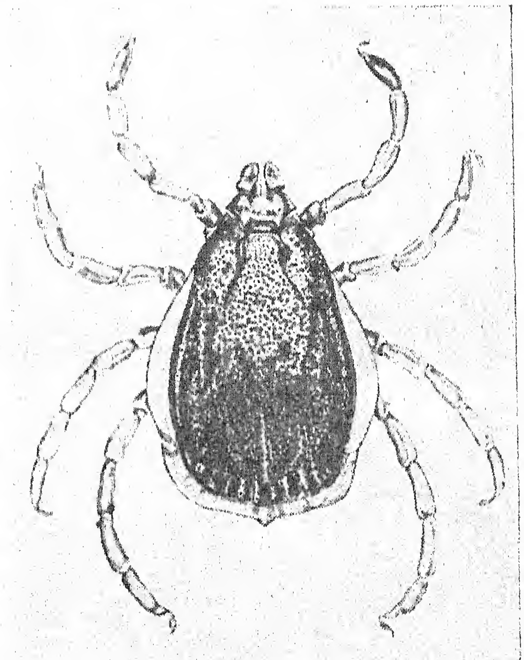


FIG. 11.—The Red Tick (Male). Magnified 9 times.

Relation to Disease.—The blue tick is the principal transmitting agent of red water and gallsickness to cattle in South Africa caused by *Piroplasma bigeminum* and *Anaplasma marginale* respectively. It is, furthermore, a transmitter of spirochaetosis to cattle, horses and sheep caused by *Spirochaeta theileri*. The mode of transmission is by the larvae of the ensuing generation after the infection has been acquired by one or other of the stages of the preceding generation. It has also been demonstrated that the infection may be transmitted by the larvae of the third generation, in the event of the infective larvae completing development on a non-susceptible animal such as a horse. European redwater or babesiosis has of recent years made its appearance in the Union due, possibly, to the introduction of the causal agent, *Babesia bovis*, by means of imported cattle and although the transmission has not yet been proved, the blue tick is probably one of the vectors. Tick-bite fever in man (*Rickettsia* species) is also transmitted by this tick.

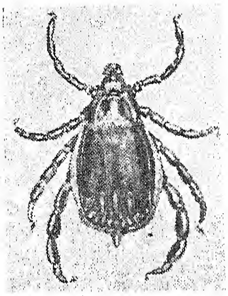


FIG. 12.—The Brown Tick (Male). Magnified 5 times.

The Argentine or Lounsbury's Tick (*Margaropus winthemi*, Karsch).

The males of this species, Fig. 10, are easily recognised by the excessive development of the 4th pair of legs, the segments of which are enormously thickened. The species is pale yellowish or brownish and the legs in both sexes are pale with dark bands at the joints. The females may be distinguished from those of the blue tick by their larger size and the banded and relatively stouter legs.

Distribution.—This tick is not indigenous to the country but is believed to have been imported from its habitat in the Argentine on horses and mules during the Boer War. It is a fairly common species to-day on horses in parts of the Orange Free State, Basutoland and the Graaff-Reinet district of the Cape Province, but has on several occasions been found on cattle, notably in the Kuruman district.

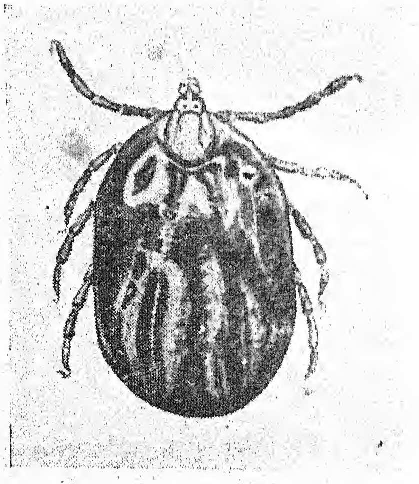


FIG. 13.—The Brown Tick (Engorged Female). Magnified 5 times.

Life History.—This has not been worked out as yet, but like the blue tick, this species has been shown to require only one host for its development. Unlike the blue tick, however, it is always more active in the winter months and high temperatures appear to affect it adversely.

There is reason to believe that it is associated with the transmission of redwater to cattle although this has not yet been proved.

The Red Tick.

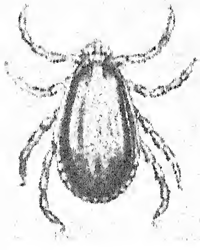


FIG. 14.—The Tropical Dog Tick (Male). Magnified 10 times.

The red tick (*Rhipicephalus evertsi*, Neumann), Fig. 11, is probably the commonest and most widely distributed tick on cattle and horses in South Africa.

Description.—It is a medium-sized species and is characterised by its red legs, which distinguish it from other members of the genus. Eyes, which are hemispherical in shape, are present and the shield is very dark brown or black with very numerous small pits, many of which are confluent, covering the surface. The mouth parts are short, as is characteristic of this group. The body of the males, other than the shield, is red as is that of the unengorged female, whereas the engorged female is bluish with a brownish tinge.

The species occurs on the hairless portions of the body and is most frequent under the tail and around and below the anus.

Life History.—Two hosts are required for the completion of the life cycle. The female, upon engorgement, drops from the animal and lays from 5,000 to 7,000 eggs which hatch in about 30 days in summer. The larvae attach themselves in the ears of their hosts and, after engorgement, moult to nymphs in this position. The period occupied for engorgement of the larvae and nymphs is from 10 to 15 days, after which the engorged nymphs drop to the ground and moult into adults in from 22 to 25 days.

The larvae can withstand starvation for up to 7 months and the adults for about one year.

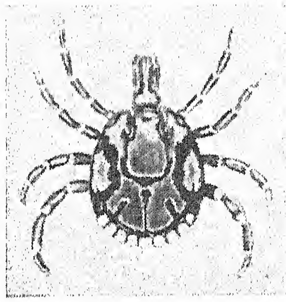


FIG. 15.—The Bont Tick (Male). Magnified 4 times.

Relation to Disease.—This species may be placed second in importance to the blue tick as a transmitter of redwater (caused by *Piroplasma bigeminum*), to cattle. The infection is derived in the larval or nymphal stage from a reacting animal and transmitted by the adult, or the infection may be acquired in the adult stage, pass through the egg, and be transmitted by the larvae of the ensuing generation. Biliary fever of horses, caused by *Nuttallia equi*, is acquired by this species in the larval or nymphal stage and transmitted by the adult. Experimentally this red tick has been proved to be able to transmit East Coast fever (*Theileria parva*), to cattle but probably plays a minor rôle in this respect in nature. Furthermore, the species transmits *Theileria mutans*, which produces a mild form of gallsickness, characterised by a mild temperature reaction and slight anaemia. It also transmits spirochaetosis ,*Spirochaeta theileri*) to cattle, horses and other classes of domestic animals.

The Brown Tick.

This species (*Rhipicephalus appendiculatus*, Neumann), Figs. 12 and 13, differs from the red tick in having brown legs, which also characterise the other members of this group. Apart from minor differences, which require the aid of a pocket lens to determine, the males may be differentiated by the fact that the punctuations on the

shield are more dense towards the centre and a small space devoid of punctuations is present on either side. The fourth pair of legs is generally somewhat thickened, although this is not a constant character, and when engorged the male bears a distinct pointed tail behind. The females, which are uniformly brown when unengorged, assume a slate blue colour when engorged but can only be distinguished from the other members of the group, apart from the red tick, by an expert. It is advisable, therefore, to identify this species by the male which may generally be found underneath the female.

Distribution.—This tick is widely distributed in South Africa but is more abundant in the lower-lying areas of the eastern and northern portions of the Union, where it occurs on a variety of domestic and wild animals, principally confined to the head region, such as the ears and around the eyes. When numerous, however, the ticks may be distributed over the body as well.

Life History.—The brown tick is a three-host tick, the larvae and nymphae occurring chiefly in the ears of their hosts, which are typically cattle. The female engorges herself in from four days to a week or more depending upon climate. She lays from 3,000 to 5,700 eggs on the ground which hatch in about 28 days in summer to several months in winter. The larvae engorge in from 3 to 7 days, drop and moult to nymphs in 2 to 3 weeks. The nymphs remain on their hosts from 3 to 7 days and moult to adults in from 10 to 18 days which engorge in from 4 to 8 days. The larvae withstand starvation for 7 to 11 months, the nymphs about 6½ months and the unengorged adults for an average period of 12 to 14 months.

Relation to Disease.—This species is the principal transmitter of the highly fatal East Coast fever of cattle caused by *Theileria parva.* The infection is acquired by the larvae and transmitted by the resulting nymph or acquired by the nymph and passed on by the adult. The larvae of the ensuing generation are not infective even though a female may have engorged herself on a reacting animal. The infection is passed on to the susceptible animal only after the infective nymph or adult has been feeding for roughly 72 hours and, at completion of the feed, the tick has lost all of the infection. As with the red tick this species transmits redwater (*Piroplasma bigeminum*), and mild gallsickness (*Theileria mutans*), to cattle. In addition it has been shown to transmit Nairobi sheep disease, an infectious gastro-enteritis of sheep caused by an ultra-visible virus, in Kenya Colony and, experimentally, it can transmit the virus disease of sheep, Louping Ill, which occurs in Great Britain.

Other Species of Brown Ticks.

The Cape brown tick (*Rhipicephalus capensis*, Koch), and the black-pitted tick (*Rhipicephalus simus*, Koch), are closely allied to the brown tick from which they are not easily distinguishable by the uninitiated nor, for practical purposes, is this of much importance as they are both three-host ticks and both capable of transmitting East Coast fever. In addition the black-pitted tick has been shown to transmit gallsickness of cattle caused by *Anaplasma marginale* and further research will no doubt reveal their capacities for transmitting other diseases as well. The Cape brown tick has a slightly lighter shade of brown than the brown tick, and the shield is densely covered with closely set punctuations or pits, whereas the black-pitted tick is a very dark brown and the punctuations are very much fewer in number and, in the male, arranged in irregular longitudinal rows.

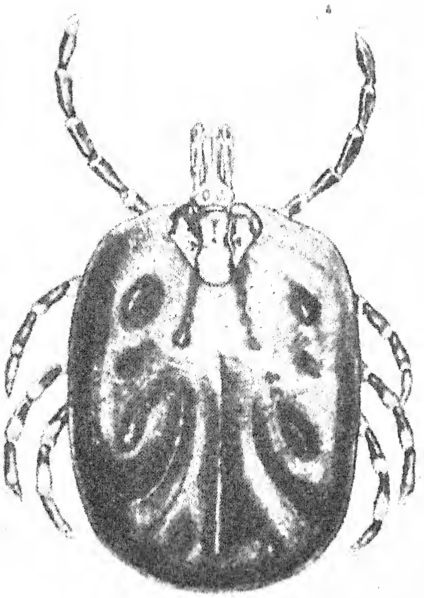


FIG. 16.—The Bont Tick (Engorged Female). Magnified 5 times.

Distribution.—The Cape brown tick occurs principally in the extreme western Cape Province and extends more or less along the coastal areas into Natal, although it has been taken in other localities but is not common. The black-pitted tick occurs more or less over the whole Union except the drier western portions. Both species occur on the larger domestic animals and several species of wild game and small veld animals, but the black-pitted tick is commonly encountered on dogs as well.

Recently a new species of tick has been discovered in the Aberdeen district and in a few localities in the eastern Cape Province, which has been named *Rhipicephalus glabroscutatum*, du Toit, due to the shiny nature of the shield, which is almost entirely devoid of punctuations. This species may be distinguished further from the preceding 3 species by the hemispherical eyes as opposed to the flat eyes of the other species.

This tick has been found to occur in clusters around and between the claws of sheep where it has been responsible for a low grade lameness, and has also been taken on steenbuck. It has not been shown to be associated with transmission of disease.

The Tropical Dog Tick.

This tick (*Rhipicephalus sanguineus*, Latreille), Fig. 14, also known as the European brown tick, is closely related to the brown tick, from which it may be distinguished by its smaller size and the fact that punctuations of irregular size are scattered more or less evenly over the surface of the shield. It is not very common in the Union and is found mainly on dogs kept in kennels. Houses in which dogs are allowed to sleep sometimes become infested with this tick. In the Zoutpansberg district of the Transvaal this species appears to occur fairly commonly on dogs and many species of wild animals in the open, and further northwards, and in East Africa, largely takes the place of *Haemaphysalis leachii* as the common tick occurring on dogs.

Life History.—It is a three-host tick, the females laying 1,400 to 3,400 eggs in crevices in woodwork, etc., or underneath old plaster, whitewash or paper on walls or under stones, etc., in nature. The eggs hatch in from 17 to 19 days and the larvae engorge in about 4 days. The moult to the nymphal stage occupies from 5 to 8 days and nymphs remain on their host for 4 to 5 days after which they moult to adults in about 12 days. The females remain on their hosts for 7 up to 21 days and the males generally longer.

Relation to Disease.—This tick is capable of transmitting biliary

fever to dogs caused by *Piroplasma canis*, the infection being acquired in one stage and passed on by the next or, the infection, acquired by the females, may be passed on by the larvae of the ensuing generation. Although this tick is by no means common on cattle it has been shown to be able to transmit gallsickness (*Anaplasma marginale*), the infection being taken up by the larvae and transmitted by the nymph. In North Africa this species has been shown to be able to transmit rickettsiosis of dogs, a highly fatal disease caused by *Rickettsia canis*. As this disease has been recorded in dogs in the Transvaal, particularly in the eastern lowveld, care should be exercised in introducing sick animals from those areas into areas where this tick occurs. In addition, the protozoon parasite *Hepatozoon canis*, which is responsible for a mild anaemia and slight fever in dogs, has been shown to be transmitted by this species of tick, the infection being acquired in the larval or nypmhal stage and transmitted in the ensuing stage but not passing through the egg stage to the following generation. This tick has also been shown to be associated with the transmission of tick-bite fever to man and is particularly dangerous in this respect, as houses in which dogs sleep may become infested by it.

The Bont Tick.

This tick (*Amblyomma hebraeum*, Koch), Figs. 15 and 16, together with the other members of the genus *Amblyomma* are among the most striking members of the family *Ixodidae* in South Africa due to the bright coloration of the shields of both males and females.

Description.—The bont tick males and females have a scutum of which the ground colour is yellowish with a red or green tinge and which bears conspicuous dark brown or black markings. The legs are banded with yellow, which is particularly evident in the females. The mouth parts are long, eyes are present and flat and the under surface bears no adanal plates or shields in the male. The festoons at the hind margin of the body of the males are uniformly white or very pale yellow.

Life History.—This is a three-host tick and the engorged female, which is dark slate blue in colour and may reach a length of about ¾ inch, may lay as many as 18,500 eggs. The eggs hatch in from 7 to 10 weeks or longer depending upon temperature and the larvae engorge upon their host for a period from 4 to 20 days. The nymphs also take from 4 to 20 days to engorge and moult in anything from 18 to 25 days, with records of up to 160 days. The females remain on their host for 6 to 25 days and the males may remain attached for periods of up to 8 months.

The larvae may withstand starvation for almost a year, the nymphs for 180 days to 250 days and the adults for almost two years.

Distribution.—This tick is typically a species of warm climates and even though accidentally introduced into areas where the winters are severe, invariably dies out. In the Union it occurs in the middle and lowveld areas of the northern, north-western and eastern areas of the Transvaal, throughout Swaziland, Natal (except for the higher lying western section where the winters are severe), and the coastal areas of the Cape Province as far south as about Port Elizabeth. It occurs on a large variety of animals, practically all our domestic animals being subject to attack, as well as wild species of animals.

Relation to Disease.—The bont tick is the transmitter of heartwater to cattle, sheep and goats, a disease which is often a limiting factor to successful farming in many parts of the Transvaal particularly. The infection is acquired from a reacting animal by the larval

or nymphal stage and transmitted by the nymph or adult respectively. An infected nymph may feed on a non-susceptible animal such as a horse or donkey without losing its infection and then pass the infection to a susceptible animal as an adult. The infection does not pass through the egg, so that adult females engorging themselves on a reacting animal and dropping to lay eggs, constitute no source of danger, as the resulting larvae are not infective.

Larvae of the bont tick have been incriminate in the transmission of tick-bite fever to man, caused by a species of rickettsia not unlike that of the eastern strain of Rocky Mountain Spotted Fever of the U.S.A. In this case the infection presumably passes through the egg.

In addition to its capacity for the transmission of heartwater to cattle, sheep and goats, the bont tick inflicts deep-seated and painful wounds owing to the long mouth parts. Such wounds are liable to become infected by bacteria which lead to suppuration and abscess formation, or the eggs of blowflies, particularly *Chrysomyia bezziana*, may be laid in and around them leading to severe infestation by maggots which greatly extend the initial wound and necessitate vigorous intervention to prevent more serious consequences.

Part III.

The Control of Ticks.

In general, all control measures aim at destroying the species to be dealt with at the most vulnerable stage or period of its development. Casual or intermittent feeders whose habit it is to feed at a period when the host is at rest, generally at night, are best attacked when they themselves are at rest in their lurking places. Those species which remain attached to their hosts for long periods at a time are best attacked on their hosts but the host itself will often determine the nature of the treatment to be applied and it is, therefore, almost impossible to generalize regarding control measures except in a comparatively few instances.

Control measures may be divided into three main categories, therefore, as follows:—

1. Quarantine or isolation of animals harbouring or suspected of harbouring ticks, with the object of allowing these ticks to complete their engorgement and leave their hosts, thus eliminating the chance of clean animals becoming infected.
2. Destruction of ticks in places of concealment away from their hosts. This involves the use of insecticidal sprays, fumigation, burning, etc.
3. Destruction of ticks upon their hosts. This involves dipping, application of insecticides by spraying, hand-dressing, dusting, etc.

Quarantine or Temporary Isolation of Introduced Animals.

This most necessary step, when introducing new animals, is only too often neglected due to lack of provision for suitable quarantine space, casualness, etc., and has led to the introduction of several species of ticks into the Union from overseas and the dissemination over wide areas of species not normally present. Quarantine measures are naturally applicable to all species of ticks but a few instances may be cited where enormous financial loss may result from failure to observe this fundamental principle with the introduction of animals. The *fowl tick* (*Argas persicus*), although not a permanent parasite in its nymphal and adult stages, remains attached to its host as a larva for periods of up to 10 days, in which stage it is generally transported from place to place. If provision is made to keep intro-

duced fowls in the crates in which they came or some other suitable place for 10 days before allowing them to mix with the rest of the birds on the property, a great deal of economic loss due to spirochaetosis and subsequent labour in eradicating the ticks may be averted. The *spinose ear tick* (*Argas megnini*) owes its introduction from America and subsequent spread in this country to failure to observe precautionary quarantine measures. Although capable of persisting in the ears of stock as larvae and nymphs for very long periods, a comparatively short quarantine period during which the ears should be examined and, if necessary, treated to kill the tick, would eliminate all possibility of introduction of the species. Heartwater in cattle and sheep is frequently introduced on to "clean" farms by means of animals harbouring infected larvae or nymphae of the bont tick, which, being of small size, are not easily observed. It is frequently not realized that the adults of this tick, which are easily seen, are not a potential source of danger so far as the introduction of the disease is concerned, as the adult females after dropping from the host do not feed again but lay eggs which give rise to uninfected larvae.

Destruction of Ticks away from their Hosts.—This method embodies the principles of burning, disinfestation by spraying, etc., and starvation of the parasites.

The *Argasidae*, which are typically rapid feeders and remain on their hosts for short periods at a time, are best destroyed by burning their places of concealment, if combustible, e.g., old fowl runs, crates, etc., in the case of the fowl tick, packing brushwood against kraal walls, etc., and burning this, in the case of the larvae and adults of the spinose ear tick, or spraying the places of concealment, such as cracks and crevices in walls, with some suitable insecticide, in the case of the human tampan.

Spraying Materials suitable for use against Ticks.—Paraffin soap emulsion is cheap, easy to make and effective and may be prepared as follows:—

Dissolve 1 lb. of cut up yellow soap in 2 gallons hot water. Add with vigorous agitation 2 gallons paraffin until the liquid assumes a white creamy appearance. This forms a stock emulsion which for use is diluted with 6 parts of water. Soft water should be used for preference as hard water tends to cause the emulsion to break upon dilution. This may be overcome to some extent by increasing the amount of soap. To greatly increase the efficacy of this spray ¼ pint of 40 per cent. tobacco extract (nicotine sulphate) may be added to the stock emulsion which, upon dilution, gives roughly a ·05 per cent. solution of nicotine sulphate.

Paradichlorbenzine-paraffin spray.—1½ lb. paradichlorbenzine dissolved in 1 gallon paraffin has been found to give a spray which is particularly effective against resistant species such as the human tampan in buildings.

Pyrethrum spray.—This consists of the extract of the flowers of the pyrethrum plant dissolved in paraffin and, although a rough extract may be prepared in the home, is generally more conveniently bought ready made. Many proprietary preparations are obtainable. This spray is extremely effective against ticks in buildings and other places of concealment.

Carbolic and Coal Tar derivative sprays.—There are many such sprays on the market, many of which are sold as dips or disinfectants. These are diluted with water according to the directions of the

manufacturers and are effective against ticks at the correct concentrations.

Destruction of Ticks upon their Hosts.—Dipping or the immersion of animals in an insecticidal solution is the most widely used method for destruction of ticks on animals. In its wider sense it includes the use of sprays, hand-dressing materials and dusts.

In South Africa arsenic in the form of sodium arsenite, which is a white powder but, in accordance with Government Regulations, must be coloured blue to avoid confusion with other white substances, is generally used in a watery solution for dipping purposes. Although in itself an extremely poisonous substance it is used with impunity if the recommended dilutions and instructions for its use are complied with. For the destruction of the different species of ticks different dilutions and different intervals in which animals should be dipped are prescribed, which are based upon the periods the particular species of tick remains upon its host.

It is unnecessary here to enlarge upon the practice of dipping, which has been fully dealt with in many departmental publications, but it cannot be over-emphasized that arsenic is an extremely poisonous substance and such precautions as (1) the watering of stock prior to dipping to minimize the danger of cattle drinking dipping fluid, (2) the provision of a well fenced-off area adjacent to the dipping tank into which the dipping fluid may be poured when cleaning of the tank becomes necessary, and (3) the proper disposal of all containers in which arsenic was stored, are essentials which, if strictly adhered to, would do much towards reducing the appalling mortality in live stock due to arsenical poisoning which occurs annually in South Africa.

The following table indicates the strengths and intervals at which sodium arsenite is recommended for dipping, together with the principal species of ticks for which these dips are designed:—

TABLE I.

Dipping Interval in Days.	Amount of Sodium Arsenite per 100 gallons Water in lb.	Percentage Strength (expressed as As_2O_3).	Suitbale for Tick Species.
3–5	1	·08	Brown tick, Cape brown tick, black-pitted tick.
5–7	2	·16	Red tick, bont tick, bont legged tick.
14	3	·24	Blue tick, Argentine tick.

The abovementioned intervals may be altered to suit individual requirements although it must be borne in mind that these intervals have been based on careful studies of the life histories of the various tick species. However, there is a general tendency to slacken off with dipping during the colder winter months, when tick life is at a low ebb, and in this way, the most generally employed 5-7 day day strength dip may advantageously be applied at 14-day intervals during these months to control most tick species. In no case, however, should the strength of the dip exceed ·24 per cent. As_2O_3 as the risk of scalding animals and poisoning becomes greatly increased.

Proprietary Dips.—There are a large number of proprietary dips available, most of which contain arsenite of soda in dissolved form as the active ingredient and, for purposes of tick destruction, it is with these only that we are concerned. The usual concentration of sodium arsenite in such dips is 64 per cent. which, upon dilution at 1:800, 1:400 and 1:267 give the final concentrations for 3-5, 5-7 and 14 day dipping, which are prescribed by Government Notice. In a few instances where the sodium arsenite concentration is below 64 per cent. the makers' directions for dilution should be followed and these are such as to conform to the standards laid down. Many rather extravagant claims are made in respect of many proprietory dips, e.g., greater tick-killing properties, increased wetting power, freedom from scalding, etc., and these properties are attributed to the adjuvants added which consist principally of soaps, phenols, cresols, etc. It is extremely unlikely that the small amounts of such substances added, when diluted to the final concentrations used for dipping, can have any appreciable effect and numerous comparative experiments have shown that such is actually the case, with the result that the Department recommends plain arsenite of soda for dipping, both from the point of view of effectiveness and cost.

Changes in the Tank Fluid.—The first consideration in the dipping of stock in sodium arsenite solutions is to maintain the dip at the correct strength. Overstrength dip is liable to scald animals, whereas if the solution is understrength, it will fail to achieve the results desired. Under field conditions a number of factors operate which may be responsible for changes in the tank strength, e.g.:

(*a*) Entry of water into the tank from rain, storm water, leaky taps, etc., will dilute the dip and reduce the concentration of sodium arsenite.

(*b*) Evaporation from the surface will increase the concentration.

(*c*) Chemical changes in the tank itself will either increase or, more frequently, reduce the apparent concentration of arsenic present.

Chemical changes in arsenical dips are brought about by micro-organisms which are capable of either "oxidising" the arsenite to arsenate or bringing about the reverse change and "reducing" the arsenate to arsenite. In this way it is frequently observed, especially in dips which are seldom used or in which a few head of cattle only are dipped, that the concentration apparently decreases upon applying the usual test, which determines sodium arsenite only. If more sodium arsenite is added from time to time, to adjust this apparent understrength, severe scalding of stock may result, and when a test for *total arsenic* (i.e., arsenic present both as arsenite and arsenate) is made it is found that the tank is overstrength. The reverse is sometimes experienced when dipping is resumed after a period of idleness, such as after the winter, and, although the tank strength may have been adjusted at the recommencement of dipping, it is found to be considerably overstrength some weeks later without the addition of more sodium arsenite. The former change is due to the absence of a sufficient amount of organic matter in the tank, with the result that those organisms responsible for oxidation gain the upper hand, and may be remedied by the addition of a quantity of fresh cattle dung. In the latter case a portion of the tank fluid must be removed and water added to adjust the concentration of sodium arsenite.

Testing of the Dip.—Dips should be tested at regular intervals to ensure that the correct concentration of sodium arsenite is maintained and for this purpose the Laboratory Dip Testing Outfit has been designed which is capable of testing either for sodium arsenite concentration or for total arsenic—the difference between the two readings giving the amount of arsenic present as arsenate in the tank. This outfit, together with full instructions, is obtainable from the Director of Veterinary Services, P.O. Onderstepoort.

The Foot-dipping Tank.—A modification of the usual cattle types of dipping tank has been designed for use with sheep, which are infested with ticks, especially the paralysis tick. The accompanying sketch, Fig. 17, gives details of the construction of the foot bath, which permits of sheep walking through it and thus covering the legs and undersurfaces of the body with the dip to destroy the ticks which occur in these situations. As previously pointed out, the paralysis tick occurs mostly in winter, when it is not advisable to immerse sheep entirely in any dip. The usual 7-day concentration of sodium arsenite, run into the tank to a depth of 16 inches, is recommended for use with the foot bath.

Spraying and Hand-dressing.—When a small number of animals only are to be treated for ticks and dipping is not practical, spraying with arsenical solutions at the above concentrations may be employed. The addition of nicotine sulphate (tobacco extract) to give a concentration of ·04 per cent., greatly increases the efficiency of such sprays. If the 40 per cent. extract is employed 1 gallon to every 1,000 gallons dip or, in smaller quantities, 4·5 cc. or roughly 1½ teaspoonful per gallon, makes a solution of the correct strength. It frequently happens that due to fatty secretions and the inaccesibility of the parts, the dip does not penetrate and thoroughly wet the skin under the tail, in the brush or the inside of the ears, and in these situations it is necessary to apply hand-dressing materials. The following hand-dressing materials, which may be prepared at home, may be recommended:—

Axle grease, 10 lb.; Stockholm tar, ½ lb.; arsenical dip containing 64 per cent. As_2O_3, 1 tablespoonful or ½ fluid ounce; 40 per cent. tobacco extract, 3 tablespoonfuls, or 1½ fluid ounces.

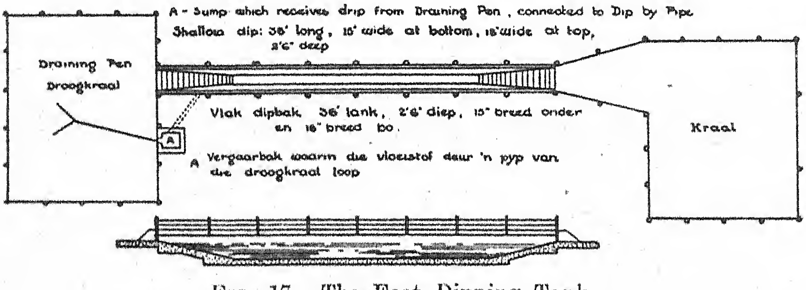


FIG. 17.—The Foot Dipping Tank.

The arsenical dip and the tobacco extract should firstly be well mixed with the Stockholm tar and this mixture then stirred into the axle grease. This mixture is black in colour and somewhat dirty to use. If a cleaner material is required, e.g., for dairy cows, the axle grease and Stockholm tar may be replaced by the following: Water, 1 gallon; yellow soap, 1 lb.; suet fat, ½ lb.

TABLE II.

Table II summarises the more important South African ticks together with the points of chief economic importance attaching to each, and indicates the control measures advocated.

Family or Group.	Tick Species.	Number of Hosts.	Disease Transmitted.	Parasite.	Disease occurs on	Control of ticks on domestic animals.
Argasidae.....	Fowl tampan.......... (*Argas persicus*)	Many	Spirochaetoses.......... Aegyptianelloses........	*Spirochaeta anserina*.... *Aegyptianella pullorum*..	Poultry............... Poultry...............	10-day quarantine and disinfection of premises.
	Spinose ear-tick........ (*Argas megnini*)	1	Nil.	Nil.	Cattle, sheep, horses, dogs, man, etc.	Treatment of ears and disinfection of premises.
	Human or eyeless tampan (*Argas moubata*)	Many	Relapsing fever......... Spirochaetoses..........	*Spirochaeta duttoni*...... *Spirocheata anserina*....	Man................... Poultry...............	Disinfection of premises.
Ixodidae......	Sheep paralysis tick.... (*Ixodes pilosus*)	3	Paralysis..............	—	Sheep and goats.......	Footbath.
	Bont-legged tick........ (*Hyalomma aegyptium* var. *impressum*)	2 or 3	Tick-bite fever.........	*Rickettsia* sp...........	Man...................	7-day dipping.
	Dog tick............... (*Haemaphysalis leachi*)	3	Biliary fever........... Tick-bite fever.........	*Piroplasma canis*....... *Rickettsia* sp...........	Dogs.................. Man...................	Handdressing.
	Blue tick.............. (*Boophilus decoloratus*)	1	Redwater.............. Gallsickness............ Tick-bite fever......... Spirochaetoses.......... Haemoglobinuria........	*Piroplasma bigeminum*.. *Anaplasma marginale*... *Rickettsia* sp........... *Spirochaeta theileri*...... *Babesia bovis*..........	Cattle................ Cattle................ Man................... Horses, sheep, cattle, goats.............. Cattle................	14-day dipping.
	Red tick.............. (*Rhipicephalus evertsi*)	2	Redwater.............. East Coast fever....... Mild gallsickness........ Biliary fever........... Spirochaetoses..........	*Piroplasma bigeminum*.. *Theileria parva*......... *Theileria mutans*........ *Nuttallia equi*.......... *Spirochaeta theileri*......	Cattle................ Cattle................ Cattle................ Horses................ Cattle, horses, etc......	7-day dipping.
	Brown tick............ (*Rhipicephalus appendiculatus*)	3	East Coast fever....... Mild gallsickness........ Redwater.............. Nairobi-sheep disease... Louping ill............. Tick-bite fever.........	*Theileria parva*......... *Theileria mutans*........ *Piroplasma bigeminum*.. *Ultravisible virus*....... *Ultravisible virus*....... *Rickettsia* sp...........	Cattle................ Cattle................ Cattle................ Sheep and goats....... Sheep, horses and cattle Man..................	3 to 5-day dipping.
	Black-pitted tick....... (*Rhipicephalus simus*)	3	East Coast fever....... Gallsickness............	*Theileria parva*......... *Anaplasma marginale*...	Cattle................ Cattle................	3 to 5 -day dipping.
	Tropical dog tick....... (*Rhipicephalus sanguineus*)	3	Biliary fever........... Gallsickness............ Rickettsioses........... Tick-bite fever.........	*Piroplasma canis*...... *Anaplasma marginale*.. *Rickettsia canis*........ *Rickettsia* sp........... *Hepatozoon canis*......	Dogs.................. Cattle................ Dogs.................. Man.................. Dogs..................	3 to 5-day dipping, handdressing.
	Bont tick.............. (*Amblyomma hebdraeum*)	3	Heartwater............ Tick-bite fever.........	*Rickettsia ruminantium*.. *Rickettsia* sp...........	Cattle, sheep, goats.... Man..................	5 to 7-day dipping.

Dissolve the soap (cut up into small pieces) in the water by heating and stir in the suet (previously melted) until the mixture becomes creamy. Allow to cool and stir in the other ingredients.

An effective hand-dressing preparation may be made by stirring into axle grease or vaseline a concentrated extract of pyrethrum. If the usual 2·5 per cent. extract is employed this is used in the proportion of 1 part to 15 or 20 parts grease.

In the case of the spinose ear tick the following mixture, which should be used only in the ears, as it is too irritating on other parts, has been found to give satisfactory results: Oil (old motor oil or cotton seed oil), 2 parts; Stockholm tar, 2 parts; turpentine, 1 part.

In conclusion it should again be repeated that the methodical and continued application of the measures recommended by the Department of Agriculture for the control of ticks, although tedious, amply repays the labour involved in increased yields from live stock. Abundant evidence has been obtained that although the adult stages of certain species of ticks may prove resistant to dipping, a well conducted dipping programme will result in complete control in time by eradicating the immature stages which are less resistant.

Municipal Compost:—

[*Continued from page* 694.

manner is very small. This practice demands that the farmer should buy the manure in the ground form but since this is more expensive than unground or even sifted manure and since grinding in no way improves the quality of the fertilizer, the farmer actually pays more for this type of fertlizer than is justifiable. If, however, the dryland farmer is convinced of the profitability of his present practice of applying fertilizer by means of some type of fertilizer distributor —a very doubtful advantage—he may safely use municipal compost as an effective substitute for Karroo manure. Although nobody is dissuaded from using Karroo manure, the Department is of the opinion that this product can be used more profitably if applied in large quantities in its unground (cheapest) form, i.e., it is of greater value to irrigation and vegetable farmers than to dryland and grain farmers.

Particulars regarding the preparation of municipal compost are obtainable on request from the officers in charge of the above-mentioned areas. Plans of the compost pits, according to which the construction work can be done, will be supplied at the same time.

The aim of the Department is to conduct further experiments in connection with the manufacture and use of compost. The price at which the final product can be sold will depend on the cost of production, and, in carrying out these experiments, due regard will be had to methods by which costs can be kept as low as possible. The object is, therefore, to try to find out how the best possible product can be made available at the lowest cost so that both the producer of compost and the consumer will eventually be satisfied.

Of all the new ventures which are usually undertaken during times of war, this national scheme of compost making from municipal refuse may certainly be regarded as one of the most important, since it aims at eliminating an age-old malpractice. It is hoped, furthermore, that this scheme which was made necessary by circumstances, will play a prominent rôle in the agricultural industry of South Africa, not only for the duration of the war but also thereafter.

Use of Waste Tobacco in Dips:—

[Continued from page 69-

production. Experiments to determine the actual position are still in progress.

The bags can be used again (for leaching only, since they are saturated with arsenic) if they are immediately washed and dried.

The leached tobacco and even the ashes contain arsenic and should be buried immediately or after having been dried and burnt. The tobacco should be mixed with some kind of fuel (wood, etc)., and burnt towards evening. Nobody must be allowed to approach the fire since the fumes are highly poisonous.

Samples for Examination.

Send samples of the tobacco and also of the mixed dipping fluid, to be tested for nicotine content. This is important, since the cattle must be dipped in fluid of the correct strength, otherwise the dipping will be nothing more than a waste of energy and material. If care is taken, however, to leach a corresponding amount of tobacco, for every 2 lbs. arsenite of soda (amount required for 100 gallons of water) added to the mixture in the tank or originally put in the tank when making a fresh mixture, no trouble need be expected. If, in addition, a sample of the dipping fluid and the tobacco is taken every few months and sent to the Director of Veterinary Services, P.O. Onderstepoort, the farmer will make doubly sure that everything is in order. If a tobacco sample is representative of the whole, $\frac{1}{4}$ to $\frac{1}{2}$ lb. is sufficient. In the case of dipping fluid, a quarter of a bottle (200 c.c.) to half a bottle (375 c.c.) is enough but three finely powdered acid tablets (red dip-testing tablets) should be added to the sample as soon as it has been taken. The bottle must be corked only after all the gas which is given off, has escaped from the bottle.

Horse-Improvement Scheme "B" for Farmers.

SERVICE SEASON, 1942-1943.

During the service season 1 October 1942 to 31 January 1943 the following stallions will stand at stud at the under-mentioned Government Institutions and Stations.

1. College of Agriculture, Grootfontein, Middelburg, C.P.: Percheron.
2. College of Agriculture, Glen, O.F.S.: Percheron and Thoroughbred.
3. College of Agriculture, Potchefstroom, Tvl.: Percheron, Thoroughbred and Jack.
4. College of Agriculture, Cedara, Natal: Percheron.
5. College of Agriculture, Stellenbosch-Elsenburg: Percheron.
6. Veterinary Research Station, Ermelo, Tvl.: Percheron and Thoroughbred.
7. Pretoria University, Pretoria: Percheron.

The Pretoria University will accept a limited number of mares under Scheme "B". Only mares in heat will be accepted and can in no case be maintained longer than three days at 1s. per day.

Main features of the Scheme are:—

(*a*) A dourine-free certificate must be submitted with the application, and farmers should have their mares tested early.

(*b*) Only halter-tame mares and jennies of approved type will be accepted—mares standing 14 hands and over and jennies 13 hands and over.

(*c*) Railway charges are paid for the forward journey only.

(*d*) The service fee is £1. 1s. and maintenance costs are 2s. 6d. per week. An additional charge of 1s. per day is made for stabling if available.

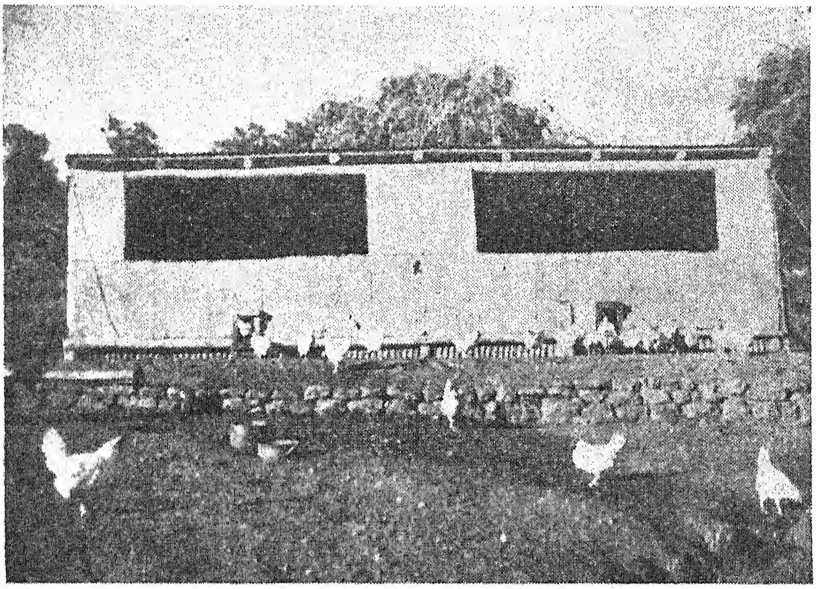
Full particulars and copy of conditions of the Scheme are obtainable from every Stud Station mentioned above.

Cheap Housing for Poultry.

J. C. D. Retief, Assistant Professional Officer (Poultry),
College of Agriculture, Glen.

PROPER housing is of fundamental importance in poultry farming, and excersises a profound influence on the growth of chicks and on egg production.

If a hen is to be profitable, she must be a prolific layer and, unless special measures are taken to safeguard the health of the



Front view of house. The house is 24 ft. long and 14 ft. wide, but is partitioned off into two equal parts by means of an inner wall. Note cross-piece below, with galvanized iron underneath.

hen through proper feeding and management, efforts directed at increasing egg production may reduce her natural vigour. Good management includes the provision of effective housing facilities.

Purpose of Poultry Houses.

Suitable poultry houses are essential for a good distribution of egg production over the months of the year.

Durability is a primary requisite for a poultry house. This does not imply, however, that the house should necessarily be expensive. Poultry houses with walls consisting of bagging treated with a cement-and-salt mixture, have been known to give satisfactory service for as long as five years, during the whole of which period the mixture was applied to the bagging on three occasions only.

Where the capital investment necessary for a durable house is prohibitive, houses made of sacking, which can be erected at a low cost, are therefore strongly recommended as a temporary measure. The profits may then be utilized for replacing these houses by brick houses in course of time.

Owing to the low capital investment required and the rapid turnover in poultry farming, necessitous farmers are sometimes completed by circumstances to go in for this branch of farming. In

such cases, too, houses with walls of sacking are recommended. The ultimate intention should, however, always be to replace these structures by permanent houses.

In parts of the eastern Free State, particularly in the Vrede district, poultry houses with walls of sacking are encountered on a fairly extensive scale and yield excellent results. Considering the high altitude of these areas, the severe winters and the sudden changes in temperature, etc., there is no reason why this type of house should not be considered suitable for use in other parts of this country.

Houses made of sacking are recommended for farmers who have adopted and semi-intensive or free-range system of poultry-farming.

Size of Poultry Houses.

The house should front towards the north-east with the ground sloping in the same direction, if possible.

The dimensions of the house will be determined by the number of birds to be housed. If brick houses are built, the size recommended for laying-hens is 18 ft. by 24 ft. In the case of houses made of sacking, these dimensions may be too large, since it is impossible to stretch the sacking absolutely taut, and the fact that so large a surface is exposed to the wind may lead to tearing. Moreover, the sacking will in the end hang limp and untidy. The durability of the walls of sacking is determined by the thoroughness and neatness of construction.

The internal dimensions of the house recommended in this article are 12 feet deep or wide and 15 feet long. Such a house will accommodate a maximum of 60 hens.

Framework.—The 6 inch corner posts must be treated with hot, old motor oil before being planted into the soil, or alternatively, they should be slightly charred. The two front corner posts should have a length of 7 ft. 6 in. and the two back posts 6 ft. 6 in. These posts must be planted to a depth of 1½ ft. An additional post is planted midway between the two front and between the two back corner posts, to hold the house and sacking firm. Two parallel strands of thick wire (No. 9) are then fixed to one front post, stretched taut round the back posts and securely fixed to the other front post. Sacking is then attached to these wires. Strips of wood may be substituted for the wire and attached to the corner posts over the sacking.

To prevent water from flowing into the house and causing the sacking to rot, the following precautions may be taken:—Take old pieces of galvanized iron, straighten out the corrugations and cut in half, lengthwise. Plant the iron in the ground on the outside of the frame, leaving 10 in. to project above the surface. Cross-pieces of wood, 4 in. in diameter, are then nailed to the four corner posts, two to each side, in such a way that the lower cross-pieces pass over the galvanized iron, i.e. 10 in., from the ground. The lower cross-piece and the galvanized iron are clearly shown on the photograph. The upper cross-pieces are fixed level with the tops of the posts.

A pole, 4 in. in diameter and 6 ft. long, should be fixed to the cross-pieces in the front of the house, 3 feet from one corner post, for holding the door of the house.

In the front of the house a strong cross-piece is fixed, 2 ft. above the lower one.

Rafters.—Two round 4 in. poles, 13 ft. long, are then fixed over the back and front cross-pieces at distances of 5 ft. apart and 5 ft. from the side cross-pieces.

Purlins.—Three round poles; 2 in. in diameter and equally spaced, are nailed across the rafters to serve as purlins, to which the roof iron is fixed.

Floor.—The floor should be watertight and capable of resisting scratching by hens. A concrete floor is, of course, the most effective, but also the most expensive.

A suitable floor is one made of round cobbles, the size of ostrich eggs, packed closely together on a layer of compacted gravel and sand, the spaces between the stones being flushed with a mixture of 1 part cement to 4 parts pure sand. The portion of the floor under the perches must be built 1 ft. higher than the rest of the floor. The droppings can then easily be swept into a receptacle and removed. Floors constructed of shale well moistened and compacted and subsequently flushed with cement, have also given excellent results.

The floor should have a slope of not more than 2 in. from the centre towards the front. Rainwater falling in the house will then flow down towards the front and run out through drainage holes at floor level made in the galvanized iron skirting.

Perches.—The perches are constructed lengthwise and are parallel to one another. To facilitats handling, they are devided into two.

Five perches (with upper surfaces somewhat levelled) 7½ ft. long, and 2 to 3 inches thick, are attached at distances of 1 ft. apart to two cross-pieces (6 ft. long and 4 in. thick), the back perch being 1 ft. from the wall. The other half is made in the same way. The frame is loose and rests on the elevated portion of the floor.

Walls.—Ordinary grain bags which are still in fairly good condition and free from holes, are cut open along the seams. These bags are then neatly and closely sewn together and fixed to the outside of the upper and lower cross-pieces of the house by means of clout nails. The bags are fixed singly and pulled taut.

In the front of the house each bag is nailed lengthwise to the lower cross-piece and the one 2 ft. higher up. The rest of the front and the door are covered with wire netting.

Two openings, each 9 in. by 12 in., are made in the front of the house, immediately above the lower cross-piece (see illustration). These openings enable the hens to move in and out at will while the door is closed. These openings can be closed, when necessary, by means of small sliding hatches.

Treatment of the Sacking.

Take 6 parts cement and 1 part salt (by volume). Dissolve the salt in a little water, add the cement and stir well. Now add more water until mixture assumes a consistency which will be easy to apply. Mix very thoroughly.

Another paint mixture used extensively in the western Cape Province, consists of the following: 12 lb. cement, 2 lb. lime, 1 lb. salt, ½ lb, alum and 1½ gallons water.

In smaller houses, e.g. for breeding pens, the roof is made in the same way as the walls, but a layer of bitumen is added.

Thoroughly moisten the bags with water and immediately apply the mixture to the outside and inside with a paint-brush, working from the top downwards. The brush should be soft, with thin bristles. A whitewashing brush is excellent for this purpose.

Nests.—It is sometimes difficult to procure wood for making nests. Inexpensive and fairly effective nests can be made according

to the manger method. Make the nests along the short walls of the house. Plant two 3-ft. poles, 2 inches thick, to a depth of 18 inches in the ground, one being against the wall and the other 16 inches from the wall. Six feet away plant two more in the same way. Nail two cross-pieces lengthwise to the tops of these poles and fix wire gauze to the cross-pieces in such a way as to form a sort of manger or trough. Chaff or straw placed in the " manger " will complete the job.

Hens which are inclined to sleep in these nests, can speedily be broken of this habit merely by taking them off every night.

The following points should be observed in aiming at durability:—

Care should be taken to ensure that the sacking never touches the soil, otherwise moisture will cause rapid rotting. Hens are also inclined to peck holes in moist parts of the sacking.

All holes must be promptly patched. Delay may necessitate the subsequent removal of a part of the sack-cloth wall. The patched portion should immediately be painted with the prescribed mixture.

Treat the walls in good time and whenever necessary. Delay may make early replacement of the walls necessary.

Material and Cost of Construction.

	£	s.	d.
8 sheets of galvanized iron, 13 ft. @ 10d. per ft.	£4	6	8
3 Gum or black wattle poles, 6 in. thick and 7½ ft. long @ 1d. per ft.	0	1	10½
3 Gum or black wattle poles, 6 in. thick and 6½ ft. long @ 1d. per ft.	0	1	7½
7 Gum or black wattle poles, 4 in. thick and 13 ft. long @ 1d. per ft.	0	7	7
4 Gum or black wattle poles, 4 in. thick and 16 ft. long @ 1d. per ft.	0	5	4
1 Gum or black wattle pole, 4 in. thick and 6 ft. long @ 1d. per ft.	0	0	6
3 Poplar or black wattle poles, 2 in. thick and 16 ft. long @ 1d. per ft.	0	4	0
4 Cross-pieces 4 in. in diameter as bearers of perches 6 ft. each @ 1d. per ft.	0	2	0
10 perches of 7 ft. 6 inch each, 2 to 3 inches in diameter, upper surface slightly levelled 75 ft. @ 1d. per ft.	0	6	3
3 lb. 5 inch nails	0	1	3
1 packet 1 inch galvanized clout nails	0	0	6
5 yds. 3 ft. wire-netting	0	2	6
14 second-hand bags without holes	0	7	0
28 ft. old galvanized iron, cut in half, i.e. 56 ft. single	0	9	4
1 lb. sewing twine	0	0	6
Door:—Hinges	0	0	9
Hasp and staple	0	2	0
Old box deal for framework of door, 2 of 5 ft. and 2 of 3 ft. 1″ × 3″	0	3	0
2 lb. roofing screws and 1 lb. washers	0	2	0
Cement Paint:—(as prescribed)	0	2	0
Cement for floor and poles	0	4	0
COSTS, (INCLUDING LABOUR)	£7	11	2

Protected Trees.

In view of the reckless destruction of certain types of trees in various districts of the north-western Cape Province, it was considered necessary to take steps for their protection. Provision was therefore made in the new Forest and Veld Conservation Act (Act No. 13 of 1941), authorizing the Governor-General to protect certain types of trees by proclamation.

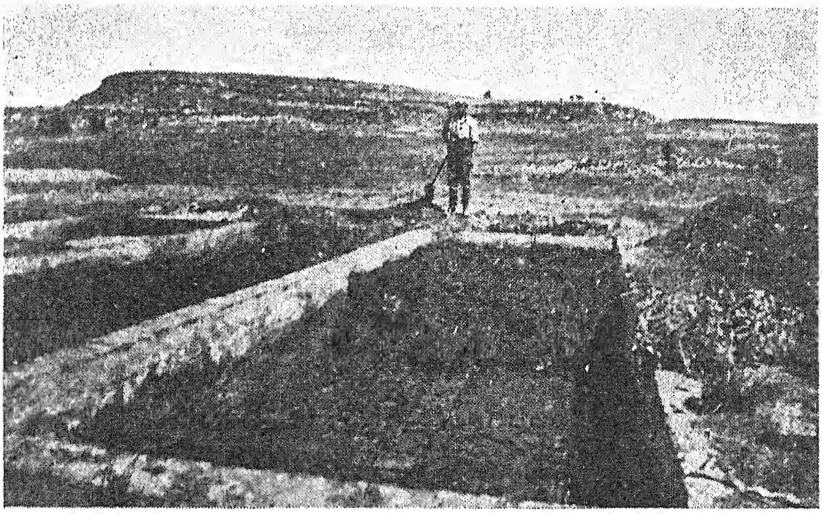
The first step in this direction has already been taken by the promulgation of Proclamation No. 214 of 1941 by which the cutting of baobab trees on any land in the Union, not being Crown forest, is prohibited, as also the cutting of any of the following species of trees, viz., vaalbos, camel thorn, mimosa, withaak, swarthaak, karree and witstam, except for domestic use, in the districts of Barkly West, Hay, Herbert, Kimberley, Kuruman, Mafeking, Taungs and Vryburg.

According to Government Notice No. 1630 of 1941, any person wishing to cut down any of the above-mentioned trees should apply for permission to the Minister of Agriculture and Forestry, through the Director of Forestry, P.O. Box 334, Pretoria, from whom further particulars are obtainable.

Manufacture of Organic Fertilizers.

L. L. Eksteen, Lecturer in Chemistry, College of Agriculture, Glen.

UNDER the prevailing circumstances, it is the duty of every farmer to go all out for maximum production in order to meet the country's requirements. On the whole, the prices being realized for agricultural products are very satisfactory, so that in most cases it will pay the farmer to follow this policy. Owing to the deficiency



A Compost Pit half-filled.

of certain plant nutrients in the soil, it is impossible to obtain maximum yields without the application of fertilizers. It would also be to the disadvantage of the farmer and the country as a whole, and extremely detrimental to the soil if maximum production were aimed at without due regard to the possibility of soil exhaustion. Not only does exploitational cropping exhaust the soil, but it is also conducive to soil erosion. Fertile soil, which has been formed in the course of thousands of years, may be completely ruined within a very short time by these two evils. The application of a system of crop rotation which includes a leguminous crop, with thorough cultivation and fertilizing of the soil, is therefore of paramount importance.

Preparation of Compost.

Before the outbreak of war, artificial fertilizes were always obtainable in adequate quantities, but this is no longer the case. Consequently, the shortage must, as far as possible, now be supplemented from other sources, and this can to a large extent be done if every farmer applies himself to the manufacture of organic fertilizers. The principal organic fertilizers on the farm are stable and kraal manure, but many farmers are also able to produce compost cheaply. Farm manure is of great value to every farmer, and, where circumstances permit, the largest possible quantity should be produced by allowing all straw, grass or maize straw to pass through the stables or kraals. If a farmer has only a few animals which are stabled or kraaled, the small amount of manure produced may be

effectively utilized for preparing a large quantity of compost at comparatively low cost. The process of manufacture is very simple. After the straw or grass has first been thoroughly soaked, it is mixed with a small quantity of manure and stacked in heaps. Decomposition sets in immediately. No further turning or labour is necessary, and after six or ten weeks, when the temperature of the mass has dropped again, the compost is ready for use. The cost must be kept as low as possible in all circumstances, since compost is not applied at the rate of so many pounds but so many tons per morgen. This organic fertilizer, which every farmer can produce cheaply, compares very favourably with Karroo manure, and in many cases it is even better.

Compost from Municipal Refuse.

The municipalities can also play an extremely important part in helping the farming community to keep soil fertility at a high level and to maintain maximum production. In nature two great processes are continually going on, namely, growth and decomposition. In the past, western civilization always paid the greatest attention to the growth aspect, while little was done in connection with the process of decomposition. Farmers cannot expect to continue reaping harvests if all their agricultural operations are of a destructive nature. Eastern nations have long ago realized the importance of this truth and have, therefore, learnt to ensure that all waste products are returned to the soil. This partly explains why eastern countries are able to carry such dense populations. On examining the position in our own country, we find that most of the farmer's products go to the cities but that nothing of the waste material derived from these products is ever restored to the soil which has produced them and in which the final process of decomposition should take place. On the contrary, this waste material is burned or buried in holes. In this way the cycle of nature is interrupted and the state of inequilibrium set up must inevitably affect the fertility and production capacity of the soil. All municipalities are, therefore, earnestly requested to give serious consideration to this matter and to make every effort to avoid the present enormous wastage of precious organic material which can be converted into valuable compost. All refuse and night soil can be utilized for making compost, the process of manufacture being cheap and effective. It should be borne in mind that vegetable farmers in the neighbourhood of cities, and farmers under irrigation schemes, urgently need this compost for maintaining production.

Particulars in connection with the process of making compost on the farm or by municipalities are obtainable from the nearest College of Agriculture.

Popular Bulletins.

(1) Calf Rearing—Bulletin No. 224. Price 3d. Obtainable from the Editor, Department of Agriculture and Forestry, Pretoria.

(2) The Export of Fresh Grapes from the Union of South Africa during the Ten-year period, 1930-39—Bulletin 225. Price 6d. Obtainable from the Chief, Division of Horticulture, Pretoria.

(3) Soft Cheese as a Food—Bulletin No. 229. Price 3d. Obtainable from the Editor, Department of Agriculture and Forestry, Pretoria.

Soil Cultivation and Increased Production.

Dr. J. H. Hofmeyr, Professional Officer (Agronomy), Stellenbosch-Elsenburg College of Agriculture (formerly Lecturer in Field Husbandry at Glen).

AT present a heavy demand for agricultural products is being experienced, so that there is no immediate danger of over-production in so far as the main crops of the Union are concerned. Prices are high and farmers now have the opportunity of reducing heavy financial burdens since they are assured of a good income.

The first question which arises is: How should farmers set about matters in order to *increase* production? The most obvious answer appears to be: cultivate a larger area, if possible. Unfortunately, however, the adoption of this advice will not always be wise or even justified, because in many cases farmers are short of labour, tractive power, implements, etc, and in others it would mean that valuable grazing or even soil which is unsuitable for cultivation would have to be ploughed. A second answer to the question is that the soil should be cultivated more *effectively* and more *judiciously*. The importance of thorough cultivation as a means of increasing production is not yet fully realized. In far too many cases efforts to increase production merely mean the extension of the area under cultivation. Generally better *cultivation* is the only means of ensuring *more economical* production. In this article the rôle which cultivation plays in crop production is discussed, the results given being based on experimental data.

Particulars of Experiment.

The experiment was carried out at the Glen College of Agriculture in the Orange Free State, and the results extend over a period of two seasons. The crop used for this purpose was maize, which is by far the most important cereal in the summer-rainfall area. During both seasons the variety planted was the Synthetic Potchefstroom Pearl.

The experiment was laid out according to the randomized block system with seven replications. Five different treatments were made in the experiment, namely:

1. *Weed control together with the maintenance of a mulch.*—After every rain which had caused the surface of the soil to become compact, the mulch was restored with the aid of an inter-row cultivator. Manual labour was employed for the removal of weeds which appeared in the rows.

2. *Clean cultivation by means of a cultivator and with the hand.*—This treatment did not differ very much from No. 1, except that no special effort was made to maintain the mulch. Cultivation was resorted to only when weeds made their appearance.

3. *Ridging of the soil in the rows.*—This was done by means of a ridging plough. The first cultivation was carried out while the weeds in the rows were still so small that they could be covered with the soil. This method of weed control is practised to a certain extent in the maize growing areas of the Orange Free State.

4. *Cutting weeds without disturbing the soil surface.*—In this case use was not made of a cultivator, but the weeds were cut by hand without in the least disturbing the soil surface.

5. *No weed control.*—After the maize had been planted the weeds were not controlled in any way, as is still only too common in practice.

The experiment was carried out on fine, sandy loam soil with a firm sub-soil. The soil used is inclined to form a fairly hard crust in course of time if not loosened periodically. The soil was ploughed deeply during the winter and left until planting time, when it was cultivated with a spring-tined harrow. The latter treatment was carried out a number of days after the first rains had fallen, that is towards the end of October or the beginning of November, in order to give all the weeds an opportunity of germinating before the young weed seedlings were destroyed by cultivation. It should be pointed out here that prior to and including this cultivation all plots received the same treatment *without exception*. Only after the maize had been planted did the various plots receive the respective treatments listed above. For the different treatments, these conditions correspond well with what happens in practice. The maize was planted in rows three feet apart, with a spacing of three feet in the row.

In so far as *fertilizing* is concerned, only super-phosphate was applied during winter at the rate of 200 lb. per morgen, immediately before the soil was ploughed.

Results.

The results of this experiment cover a period of two summer seasons, namely 1939-40 and 1940-41. As regards rainfall and, consequently, the general climatic conditions, these two seasons differed very widely, as is reflected from the rainfall figures given in Table II.

Table I shows the grain yield expressed in bags per morgen, the yield of dry plant material expressed in tons per morgen, and the statistical significance of the differences between the treatments.

TABLE I.—*Grain and stover yield (dry plants).*

	1939–40.				1940–41.			
	Grain.		Stover.		Grain.		Stover.	
	Bags. per morgen.	Per-cent.	Tons per morgen.	Per-cent.	Bags per morgen.	Per-cent.	Tons per morgen.	Per-cent.
1. Mulch.............	8·60	131·0	2·04	111·5	26·17	109·2	3·67	110·8
2. Clean cultivation....	9·15	139·4	1·99	108·5	24·83	103·7	3·42	103·0
3. Ridging of the soil	7·30	111·4	1·65	90·2	28·30	118·1	3·81	115·2
4. Cutting of weeds...	6·90	105·2	2·12	115·8	23·24	97·5	3·14	94·8
5. No weed control...	0·85	13·0	1·36	74·0	17·12	71·5	2·52	76·2
Average yield.........	6·56	100	1·83	100	23·93	100	3·31	100
Standard error.......	0·71	10·8	0·09	4·95	0·53	2·20	0·19	5·83
Significant difference.	2·0	30·4	0·26	14·0	1·49	6·2	0·55	16·3
z—value............	1·5523		1·2629		2·0833		0·9708	

For P = ·01,nl = 4, n2 = 24, z is equal to 0·7197, i.e. the chances for the reliability of the differences (between the treatments) greater than the significant difference are much greater than 100 : 1.

The following conclusions are justified from the results given in Table I.

A. 1939-40 *experiment.*

(*a*) *Grain yield.*—(i) All cultural treatments, viz., Nos. 1, 2, 3 and 4, are significantly better than no weed control at all. (ii) Clean cultivation as in treatment No. 2 is also significantly better than weed control without disturbing the soil surface (Treatment No. 4).

(*b*) *Stover yield.*—(i) All cultural treatments, i.e., Nos. 1, 2, 3 and 4, are significantly better than no weed control. (ii) Maintenance of the mulch, clean cultivation and weed control without disturbing the soil surface, as in treatments 1, 2 and 4, are significantly better than ridging of the soil (Treatment 3).

B. 1940-41 *experiment.*

(*a*) *Grain yield.*—(i) All cultural treatments, viz., Nos., 1, 2, 3 and 4, are significantly better than no weed control (Treatment 5). (ii) All cultural treatments (Nos., 1, 2 and 3) are also significantly better than weed control without disturbing the soil surface. (iii) Ridging of the soil (Treatment 3) is significantly better than the maintenance of a mulch and clean cultivation (Treatments 1 and 2).

(*b*) *Stover yield.*—(i) All cultural treatments are significantly better than no weed control. (ii) Maintenance of the soil mulch and ridging of the soil (Treatments 1 and 3) are significantly better than weed control without disturbing the soil surface.

Discussion.

A comparison of the yield figures for the two seasons, as given in Table I, immediately shows a striking difference in the yield per morgen. During the 1939-40 season the yield was much lower throughout than during the 1940-41 season. This is explained by the great difference in rainfall between the two seasons. The 1939-40 season may be regarded as unfavourable, and the 1940-41 season as an unusually good season for the Glen area, except that the rainfall ceased very suddenly at the end of February.

TABLE II.— *Rainfall figures at College of Agriculture, Glen, for summer seasons* 1939-40 *and* 1940-41.

Season.	October.	November.	December.	January.	February.	March.
	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.
1939-40..........	5·37	4·48	1·22	1·64	3·13	4·43
1940-41..........	0·59	5·80	4·40	2·39	6·90	0·33
Average 20 years..	1·29	2·80	2·64	3·27	2·65	3·39

This table shows clearly that the rainfall for the 1939-40 season was very low during the critical months, December and, especially, January, and far below the average figures for 20 years, whereas the rainfall during December and January for the 1940-41 season was very favourable. It is interesting, therefore, to compare the effect of different methods of cultivation and weed control, as well as no weed control after planting, during two widely different seasons. On the whole, 1939-40 may be considered a season of crop failure.

Grain Yield.

Experiments which had previously been carried out on similar lines at Pietersburg (Nothern Transvaal) and at Glen, are quoted by Saunders([1]). Although the treatments were not all identical with those of the experiment under discussion, they nevertheless corresponded in the following respects: In the Pietersburg experiment there were, among other things, cutting of weeds without disturbing the soil surface, ridging of the soil, and no weed control, while the former Glen experiment included treatments such as cutting of weeds without disturbing the soil surface, ordinary inter-row cultivation as well as no weed control. Both experiments covered several years, and in the main the results correspond with those of the experiment under discussion. So, for example, the far-reaching effect of weeds on the yield of maize has been indisputably proved. It was also found in both cases that maize yields are much poorer if weeds are cut off without cultivation of the soil after the maize has been planted, instead of being controlled by means of inter-row cultivation.

Ridging of the soil proved successful in the Pietersburg experiment although it was not the most effective of the various methods of cultivation. In the Glen experiment the ridging method gave good results as is shown by the grain-yield figures in Table I. During the favourable 1940-41 season this cultural practice produced better yields than any of the other treatments, although during the unfavourable 1939-40 season it yielded lowest of all the cultural methods. Apparently, therefore, this method is more liable to fluctuate than any of the others. Where production is in an way limited by moisture conditions, care should be taken to ensure that ridging takes place along the contour, otherwise rainwater will be conducted along the furrows instead of being caught up and conserved. The reason why ridging yields relatively poorer results during unfavourable dry seasons, is due to the fact that a considerable proportion of the moist soil is exposed during this treatment, and that the loss of moisture is greater than when the cultivator is used. According to Saunders([1]) the reason why ridging often gives the best results in dry sections of the country is probably to be found in the fact that the young weeds in the rows are covered with soil and so destroyed. In other words, it is a matter of better weed control in comparison with ordinary inter-row cultivation where *no* manual labour is employed for cultivation in the rows.

Although the difference is not statistically significant it nevertheless is interesting, as indicated by the results given in Table I, that during the 1939-40 season clean cultivation with the cultivator and by hand produced higher yields than the maintenance of a mulch together with cultivation in the row by hand, while the very opposite occurred in 1940-41. It is difficult to conclude whether or not this slight difference during the dry season is due to a greater loss of essential moisture as a result of intensified cultivation in order to maintain the mulch. What is of importance, however, is the fact that the maintenance of a mulch is not essential but that the number of cultivations as well as the time when these should be carried out must be determined by the appearance and growth of weeds. According to McCall([3]) a mulch may even to a certain extent be detrimental for the absorption of rainwater if each shower of rain is so light that moisture does not properly penetrate the loose soil. In such loose soil the rate of evaporation is also much greater than in compact soil, since the volume weight is lower in loose soil and the moisture

content higher with a consequently greater rate of evaporation. It should be pointed out here that at Glen the rains consist for the most part of isolated light showers, especially during unfavourable seasons.

The old theory in connection with the great advantage of a mulch for preventing loss of moisture is too well-known to require detailed discussion here. On the other hand there is the more recent theory that under normal field conditions, which include dry-land production, a soil mulch has no water-conserving effect whatever. Veihmeyer(5) is one of the leading champions of this theory. Subsequent investigations carried out in this connection in the Union support the findings of Veihmeyer. Mention may be made of the work done by Esselen(2) on light sandy soil, and that undertaken by Eksteen and van der Spuy(1) on heavy, clayey soil. In spite of these findings, however, the figures given in Table I clearly show that on the whole the maintenance of a mulch, clean cultivation and ridging yield better results than no cultivation after planting and control of weeds without disturbing the soil surface. It would be erroneous therefore to conclude from the results of research work mentioned above that there are no advantages attached to the cultivation of the soil after planting time. In the light of the above investigations it may safely be inferred that the advantage of maintaining a mulch and carrying out other cultural practices, as reflected in greater yields, lies in the fact that the loose, cultivated surface soil is better able to *catch* and *absorb* rain water than uncultivated soil which eventually forms a thin crust through which rain water penetrates with difficulty and down which it runs more readily if the ground has a slope. Loosening of the soil results in *better aeration* and consequently more intensive micro-organic activity in the soil, as well as more vigorous root development.

Stover Yield.

The stover yield is important in so far as it is an indication of the amount of plant material suitable for grazing or feed for animals which remains on the land after the grain has been reaped. It also serves to indicate the relative quantity of green material, for ensilling for instance, which may be expected from the different treatments. It is sufficient to mention, however, without detailed discussion, that the results broadly correspond to those for the grain yield. Of special significance is the fact that during an unfavourable season, as in 1939-40, the fluctuations in the grain yield with the different treatments are much greater than in the case of the stover yield, whereas during a favourable season, as in 1940-41, this is not the case, as can be seen from the yield figures in Table I, calculated as a percentage of the average yield. There also appears to be a closer correlation between grain yield and stover yield with the different treatments during favourable seasons than is the case during unfavourable seasons.

It is also abundantly clear that where weeds are allowed to compete with maize plants, not only the grain yield but the stover yield is seriously affected. Many of the weeds, moreover, are totally unsuitable for grazing or inferior in nutritive value.

General Conclusions.

(1) Where moisture is in any way a factor limiting production—and that includes the extensive maize-growing areas of the Orange Free State, as well as other parts of the country—it is absolutely essential that rigid weed control should be practised in order to increase production or even, in some cases, to produce a crop at all.

Weeds and drought have an identical effect on the growth of maize and other agricultural crops. Hence, the drier and more unfavourable climatic conditions are, the more imperative it is that effective weed control should be practised—and the sooner the better.

(2) The production of maize may be considerably increased, without extending the cultivated area, merely by practising more effective weed control. Even for the more economical production of maize, better weed control by hand and inter-row cultivation are essential.

(3) Although the use of a ridging plough for the inter-row cultivation of maize often yields excellent results, this implement should be judiciously used. The use of an ordinary cultivator appears to give more constant and generally satisfactory results, provided the weeds are subsequently hoed by hand in the rows. The ridging plough also requires more tractive power and greater effort in handling than the ordinary cultivator. An additional disadvantage is that it leaves the land uneven, making subsequent ploughing more difficult.

(4) The maintenance of a mulch appears to be unnecessary but, generally speaking, under dry-land production the number of cultivations, as well as the time of cultivation, should be determined primarily by the appearance of weeds. The additional cultivations just to maintain the mulch apparently have no or little effect on yield, and only increase production costs.

(5) Under the prevailing conditions, when the scarcity of fertilizer and labour may definitely have a limiting effect on production, especially if the area under cultivation is injudiciously extended, it is essential that due account should be taken of the factors mentioned. This can be done only by thorough cultivation of the soil planted and the complete eradication of weeds in order to increase the *yield per morgen* as effectively as possible. The ploughing, fertilizing and planting of extensive lands frequently means a wastage of valuable fertilizer if the yield is low as a result of poor weed control due to a shortage of labour. In that case the weeds enjoy the benefit of the fertilizer.

(6) In many cases it would pay farmers to bear in mind that the application of fertilizers cannot make up for neglect of proper weed control and the other operations associated with thorough cultivation. Not only the agricultural crop but the weeds also are nourished by the fertilizer and frequently the competition set up is to the detriment of the former, especially where moisture conditions are not so favourable.

The writer herewith wishes to express his thanks to Mr S. W. Pienaar and Mr W. A. Nieman of the Glen College of Agriculture for their assistance in carrying out the above experiment.

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Eelworm or Root Gallworm.

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GALLS often occur on the roots of plants and are caused by a very small nematode or round worm, comonly known in South Africa as eelworm or root gallworm and scientifically by the name *Hetorodera marioni* (Cornu) Goodey.

The worm occurs practically throughout the entire habitable world, but it is mainly a pest of warmer countries and is probably indigenous to South Africa, although it is not possible to determine with certainty wether it has been inroduced from other parts of the world or not.

It is a parasite on the roots of cultivated as well as wild pants; more than 1300 different varieties of plants are already known to be hosts.

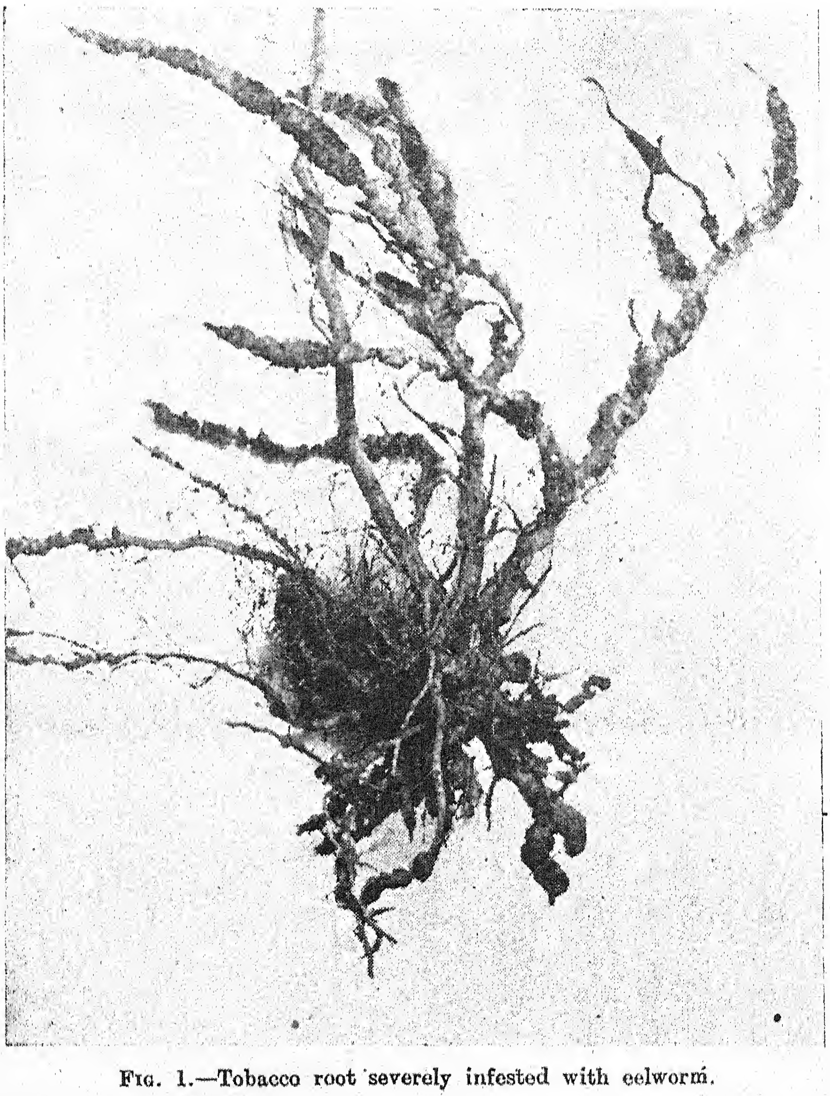

FIG. 1.—Tobacco root severely infested with eelworm.

This parasite annually causes losses amounting to thousands and tens of thousands of pounds. The full extent of this damage is not generally realized since not only the yield, but the quality of the infested crop, is adversely affected. Eelworm is undoubtedly the most serious pest with which the potato, tobacco and vegetable farmers have to contend.

Since the parasite is presumably indigenous to South Africa, it is possible that even virgin soil may be infested.

Characteristics of Eelworm.

When infestation is comparatively severe, i.e. if the main roots are severely affected, plants attacked by the worm, will be smaller than normal, of a yellowish colour, and in dry and warm weather will become wilted much sooner than normal plants, (Fig. 1). Should these plants be uprooted, nodules will be found on the roots; if the roots are attacked while still young, the nodules develop to an enormous size and a large percentage of the affected plants die.

The Afrikaans name " vrotpootjie ", which is commonly used for this pest, is undesirable and may lead to confusion since other plant diseases are known by this name.

When plants become infested late in the growing season, the nodules are small and usually occur on the lateral roots only. In the case of tobacco it has been found that, where ground has been allowed to lie fallow for two years, and the crust of the soil loosened monthly, so as to eradicate weeds, only the lateral roots were attacked, the yield was normal and the nodules very small. The farmer will, therefore, believe such land to be free of the pest, and will not examine the plants to ascertain whether nodules actually occur on the roots or not. The same thing may occur in the case of virgin soil and also in cultivated soil after a long period of heat and drought. Certain plants, such as maize, strawberries, freesias, gladioli, irises, and many weeds do not develop nodules to any extent even when infestation is fairly severe. Pimple-like nodules are formed on potatoes and dahlias (Fig. 2). The above-ground parts of plants such as paw-paws, zinnias and others appear to be quite normal in spite of being severely affected.

Nodules of Nitrogen-fixing Bacteria.

Legumes normally develop nodules on their roots. Thees nodules are caused by the useful nitrogen-fixing bacteria and must not be confused with the nematode nodules (Fig. 3) from which they can easily be distinguished. The eelworm nodules are formed in the tissues of the root and cannot be removed without breaking the root, whereas the nodules formed by nitrogen bacteria can be pulled off quite easily without injuring the root. Even these bacterial nodules may be severely attacked by eelworm, and cases have been observed where only the bacterial nodules have become infested and no other part of the roots.

In addition to causing the nodules, eelworm makes plants more susceptible to bacterial and fungous diseases, such as wilt disease in cotton, Rhizoctonia in groundnuts and other similar diseases. Infection occurs through the lesions which the worms cause in the roots.

Life Cycle and Habits.

Eggs, larvae (Fig. 4), full-grown females and females in various stages of development may be found in the larger nodules. The eggs and larvae are so minute that they cannot be detected with the naked eye. The ovipositing female is gourd-shaped (Fig. 5) and of an opalescant white colour; if a nodule is broken open the female will

be revealed, but not the eggs. The female lays from 500 to 1000 eggs in a jelly-like sac secreted by her. In size, the jelly sac together with the eggs almost equals that of the female. The eggs are mostly found in a nodule, where they may also hatch, but when a female occurs near the edge of a nodule, the sac may break open, discharging the

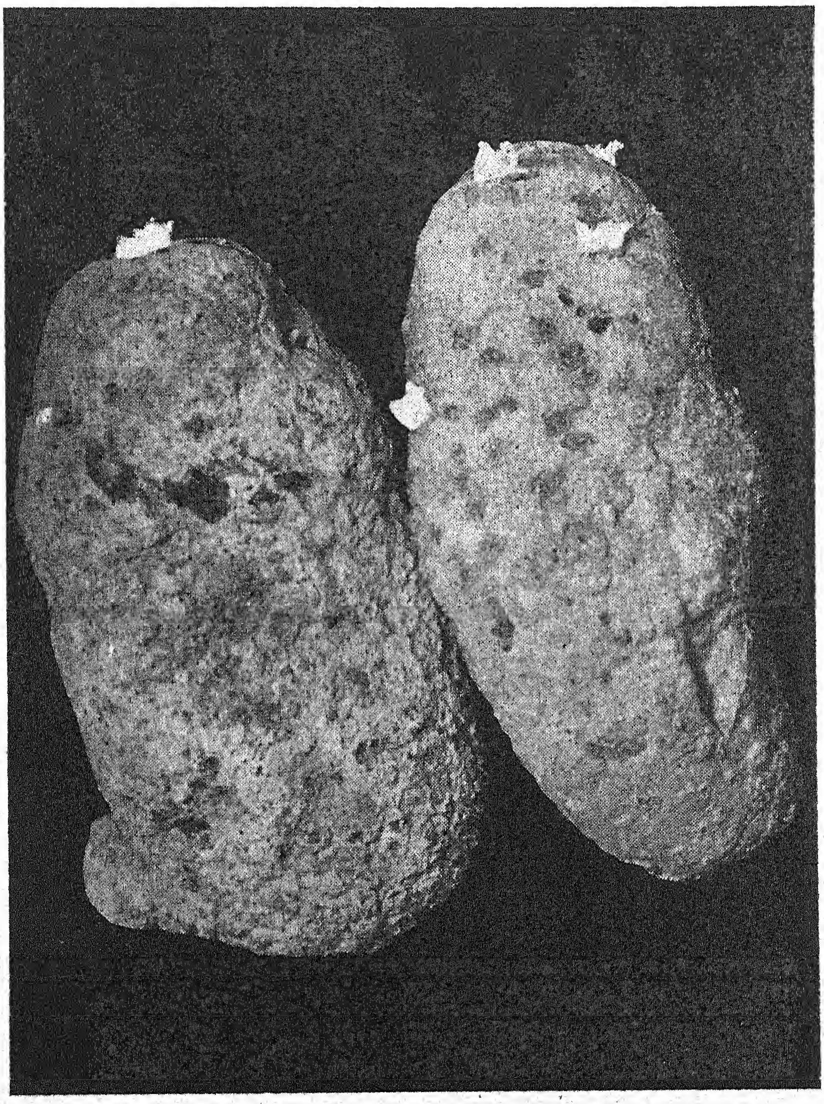

FIG. 2.—Potatoes severely infested with eelworm.

eggs into the soil. In times of drought, the jelly loses moisture and becomes tough and hard and so protects the egg mass. When water is again present in the soil, the jelly absorbs moisture and expands and the eggs are liberated in the soil where they hatch.

From observation of the roots of tobacco plants, it has been ascertained that the female is frequently discharged into the soil together with the gelatinous egg sac. Only the opening through which

they have escaped then remains in the root, and in such a case infestation is no easily detected. Males are always rare and occur only when conditions are unfavourable, that is in old and severely infested plants.

The eggs can develop normally without fertilization. During adverse conditions they do not develop, but remain in old nodules and in the soil until conditions again become favourable. Larvae in the soil migrate to the roots of host plants, and those hatched in nodules either remain there or move to uninfested parts of the root. They may even abandon these to find other roots. If they fail to reach a plant root they are able to exist in the soil for a year or longer without food. As a rule larvae are able to move about independtly in the soil, but when conditions are unfavourable, they are restricted in their movements. The larvae usually bore their way into young roots near the growing point although they may also enter at other points. In cases of severe infestation, a number of larvae may enter the root at the same point. Once they have gained entrance to the root, they become motionless, the surrounding plant cells are stimulated by some substance secreted by the worms and develop into so-called "giant cells". These cells supply the larvae with food, which is sucked up by ths specially adapted mouth parts of the worm. These giant cells cause the nodules which are visible on the outside of the roots and which deform the vascular bundles, preventing the stem and leaves from obtaining an adequate supply of food. This in turn results in the typical symptoms of root gallworm diseases. Inside the root the larvae begin to develop, the great majority becoming females.

According to data by Tyler, the most suitable temperature for the development of the nematode is 27°C. Development is retarded if the temperature varies from this point. The stages-passed through during one generation, i.e. larva, adult, egg stage and larva, cover a period of 25 days at a temperature of 27°C., and 87 days at a temperature of 16·5°C. Eggs are not laid at a temperature higher than 31·5°C. or below 14·3°C. Larvae bore their way into roots at temperatures as low as 12°C. and as high as 35°C. It takes from 21 hours to 3·5 days to form nodules at a temperature of 35°C., and 9 to 11 days at 14°C. At a temperature of 27° C. the eggs take from 9 to 11 days to hatch, and the larvae 15 days to reach the adult stage, i.e. until ovipositing commences again.

According to temperatures taken at a depth of 10 inches in the soil in the district of Brits as many as 10 generations can succeed one another in the course of a year, provided suitable host plants are available. The temperature varies as follows: from the end of May to the middle of August it is about 13·3°C.; subsequently there is a gradual rise in temperature until for eight months of the year it varies between 24° C. and 27° C. There is, naturally, a considerable period during which no suitable host plants are present on the lands so that no propagation of the nematode takes place, that is during the wheat season, provided no susceptible weeds are growing on the land. The duration of the life cycle also varies according to the host plant, since some plants are more suitable for the development of the worms than others. According to Grodfrey the completion of the life cycle from the larva stage to the ovipositing stage extends over a period of 35 days in the case of the pineapple, and 19 days in the case of the cowpea, under identical conditions. There are numerous plant varieties, of course, which serve as excellent host plants and when developing in them, the eelworm completes its life cycle in the same length of time under similar conditions.

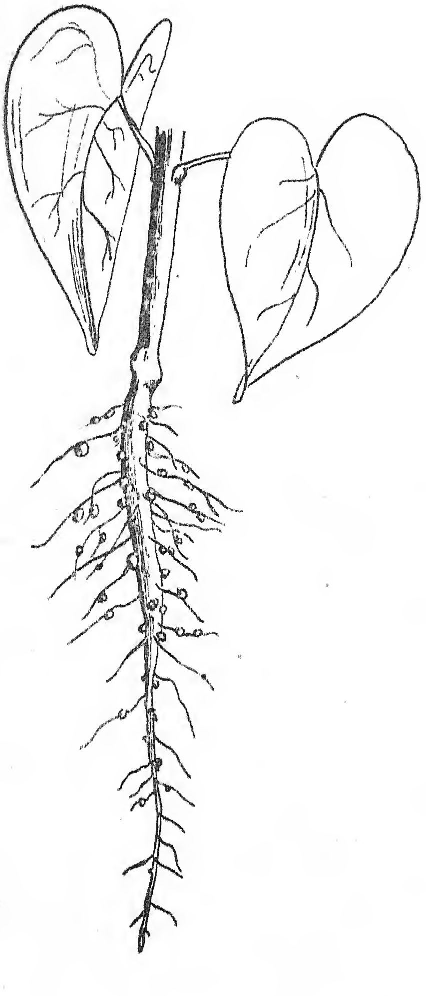

Fig. 3.—Legume showing Bacterial Nodules.

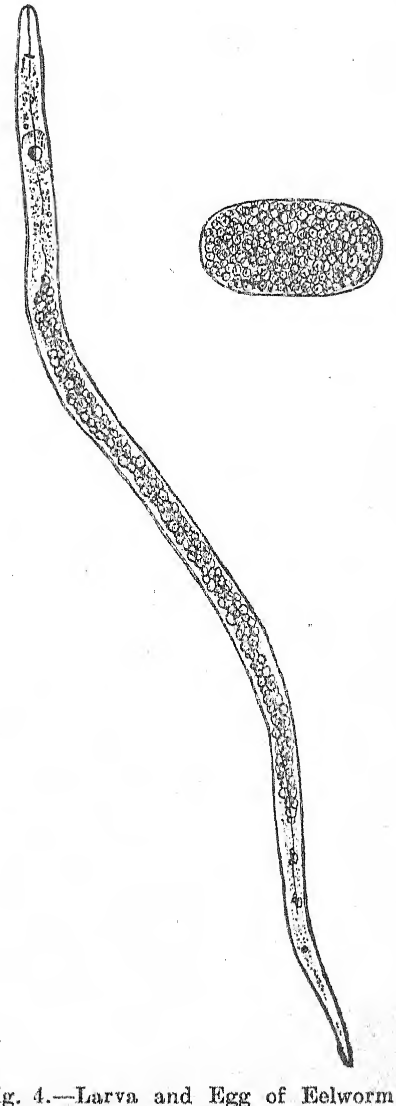

Fig. 4.—Larva and Egg of Eelworm Highly Magnified (Semi Schematic).

How to Determine whether Virgin Soils or Old Lands are Infested.

It is always desirable to ascertain whether and old land which has lain fallow for some time, or virgin soil, is infested with eelworm or not. It frequently happens that valuable crops are planted on old or new lands in the belief that they are free from eelworm. Very often however, especially in th case of sandy soil, a land used in this way is by no means free from eelworm, and in consequence a valuable crop is severely attacked. It is, therefore, advisable to ascertain wether such land is free from this pest by first planting a very susceptible crop, such as tobacco, tomatoes or cowpeas in it. Should these plants remain unattacked, a more valuable crop can be cultivated in the soil with safety, provided the water supply is pure. The susceptible test crop should be grown on the land for at least two months during the summer.

Control.

Control measures for eelworm are divided into two groups: (1) Preventive measures, and (2) measures for the control of the worm in soil already infested.

(1) *Prevention* is on the whole most important and is the measure most easily carried out. It is consequently the first consideration in a thorough farming system. In areas where water for irrigating lands or for keeping seed beds moist (as in the case of tobacco) is obtained from rivers and dams prevention is a very difficult problem if this water happens to be infested. But apart from such cases, the methods are comparatively simple and merely require common sense and carefull application. If one or more lands are infested on a farm the farmer should take the necessary measures to prevent the infestation from spreading, not only for the benefit of his own farm, but also in the general interest. In the first place such lands should be isolated by digging deep trenches with high banks around them. This prevents flood-water, after heavy rains, from spreading larvae and eggs, and perhaps even infested portions of roots to clean lands. The banks of the furrows should be sufficiently firm to withstand heavy pressure of flood-water. Drainage furrows or canals leading from the furrow system will naturally be required to carry off the water parts where no further eelworm damage can be caused, for instance to vleis, streams or rivers. Care should also be taken not to allow cattle or other animals passing over infested lands to carry infested soil on their hoofs to uninfested lands. If cattle must pass over infested ground as in the case of oxen for ploughing, their hoofs should be washed before they are again allowed on clean lands. Ploughs and other agricultural implements should also be cleaned carefully after having been used on infested ground. Infested soil may even be carried to other lands on the shoes of farm labourers.

When crops such as tobacco, cowpeas, and tomatoes, have been cultivated on infested land, it is essential that the roots should be pulled out of the soil, piled into heaps on the lands and burnt as soon as they are sufficiently dry.

Potato farmers should lift infested potatoes at an early stage before larvae which may have hatched in the tubers are able to migrate into the soil. The pest is frequently spread by planting lands with seedlings from infested seed beds, as in the case of tobacco, tomatoes, and other crops, or by planting seed potatoes with eelworm galls on them. According to a rough calculation (in the case of tobacco at any rate) approximately half a morgen of seed bed is allowed for 50 morgen of tobacco land so that the farmer will increase the infested area on his farm a hundredfold by planting his lands from infested seed beds. Another source of danger is infested potatoes, tobacco and tomato plants obtained from other farms. Careful examination of the roots before transplanting is absolutely essential, and any infested plants should be destroyed immediately.

It has been determined that the eggs and larvae of eelworm retain their viability for a considerable time in water as well as in the ground. As mentioned above, water also happens to be one of the chief means of distributing this pest. Consequently, direct irrigation with water out of a stream or a river should be avoided, especially in the case of seed beds. It is safe to water seed beds with a watering can and water from a bore-hole. If bore-holes are not available, a well, sunk beside a stream into which the water cans percolate through the ground, will do. Such a well should however be protected from infection by flood-water.

For the irrigation of seedbeds, water may be pumped into a tank or cement dam having two outlet taps at different levels. One should be on a level with the bottom of the tank or dam, the other approximately fifteen to eighteen inches higher. The tank should be filled and the water allowed to stand for at least 48 hours before being used in order to allow worms and other impurities to sink to the bottom.

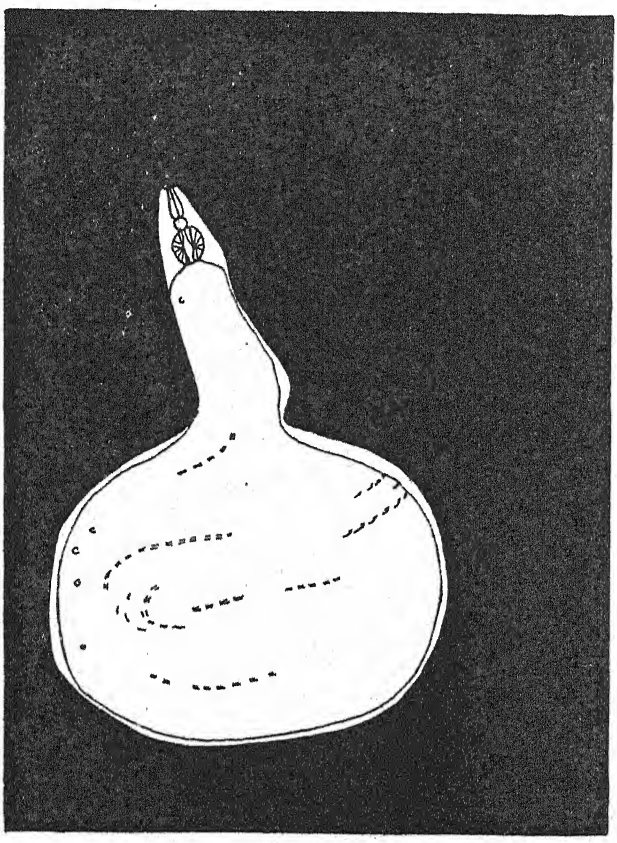

FIG. 5.—Adult female of *Heterodera marioni*.

The water used for seed beds should be drawn from the upper tap while the lower tap is used to drain off sediment or eelworms only. Although all the nematodes will not sink to the bottom, the majority will do so whereby the risk of infection will be considerably reduced.

In controlling the pest in soil already infested, one may use the following methods:—

(*a*) Cultural practices,

(*b*) Poisons.

The following treatment may be applied to seed beds on sandy and sandy loam soils. For a bed measuring ten yards by one yard, spray a solution of 1½ lb. sodium cyanide dissolved in 4 gallons of water uniformly over the bed, and then water the bed until the cyanide solution has penetrated into the soil to a depth of one foot. Now apply a solution of 2¼ lb. amonium sulphate dissolved in 4 gallons of water, and water again until this solution too, has soaked in to a depth of 1 ft. In the case of very sandy soil, the quantity of cyanide may be

reduced, provided the ammonium sulphate is increased by 50 per cent., that is for every 1 lb. cyanide, 1½ lb. ammonium sulphate must be added. The application of these solutions serves a dual purpose, since they also act as good fertilizers. Germination will, however, be poor, unless an interval of three weeks to a month elapses before the seed is sown. Unfortunately this treatment, even when larger quantities of the chemical substance has been found to yield satisfactory results on these soils.

Carbon bisulphide in the proportion of 8 pints to a bed of the same size has been found to have the same effect as sodium cyanide and ammonium sulphate, but the former substance is considerably more expensive and lacks the good fertilizing properties of the latter combination. It is of course of the utmost importance to keep seed beds free from weeds.

Only seedlings and seed potatoes which are free from eelworm should be planted. Farmers may make permanent seed beds, provided that, directly the seedlings have been tansplanted, the remaining plants are immediately removed from the beds and the soil ploughed or dug up. This digging must be repeated every two months and all weeds must be removed regularly. Before planting time, humus must be incorporated into the soil and a treatment of cyanide and ammonium sulphate or carbon bisulphide must be applied again.

The word control generally implies the use of posions. In the case of eelworm infestation, however, the cost of effective poisons is prohibitive. The following substances have, however, been tested against eelworm:— *chloropicrin* (tear gas), *Cyano gas*, *Cyanide*, *dinnitro-ortho-cresol*, *unslaked lime* (quicklime), *copper sulphate*, *table. salt*.

Control by Agricultural Methods.

Fallowing and drying Out of Lands. The conscientious application of this measure gives good results, but it should be understood, that no agricultural method is ever completely effective in controlling the eelworm.

Fallowing or drying out of the soil must be applied for at least a year, more particularly during the hot summer months. The soil should be ploughed once every month and all vegetation eradicated, until the lands are completely devoid of all plant growth. This measure has been successfully applied against the eelworm in parts of the Vaalhartz Area. The longer the duration of this drying-out process, the better will be the results obtained. Sandy soil may, however, be seriously damaged as a rsult of this procss and farmrs must excersise the greatest care on such soils. On sandy loam and turf soils, it can be applied very successfully. Fallowing the soil for two years has yielded good results, but it is essential that weeds and other vegetation should be removed regularly.

In field tests, soil which had lain fallow for two years were subsequently planted with tobacco and two good crops were obtained. This tobacco was not planted before the middle of December, however, since after this time of the year the worm becomes considerably less active. After each crop the infestation increases appreciably, and farmers must examine the plants thoroughly after the first crop, to ascertain the proportion of plants infested. If more than 10 per cent. of the crop is severely infested, it will not pay to cultivate a second crop.

Where, owing to the lack of necessary facilities and soil area, farmers find it difficult to apply the drying-out and fallowing methods, it is recommended that a cereal crop should be sown in winter and

either reaped or utilized as feed. In parts of the country where grain ripens in October, the soil should be ploughed directly after the crop has been harvested. Where the cereal matures later, the crop should be utilized either for green mature or for feed. The soil should be given an opportunity to dry out well during the summer months. Heavy rainfall stimulates the worms which become more active, utilize the reserve feed stored up in their bodies, and then starve to death. In winter the worm is less active, and fallowing, drying out or planting an immune crop will yield moe or less the same results by starving the worms. Each farmer should determine for himself the length of time over which it is desirable for such a practice to extend, before a susceptible crop such as tobacco, potatoes or vegetables can once more be planted on the lands. Tobacco will give better results than potatoes, since the tubers of the latter are attached, while the lateral roots of tobacco can stand a fair amount of infection before the crop is damaged. Farmers should incorporate large quantities of humus, manure and other substances into the soil, to maintain its fertility.

Rotational Cropping.—Like drying out and fallowing, rotational cropping is designed to starve the worm in the larvae stage. Since the larvae mature only in the roots of suitable plants, they are either killed or their development is impeded by such rotation. Unfortunately there are only a few plants which can effectively be used in the rotational cropping scheme. The following are examples of such plants:—

(1) Winter cereals (wheat, oats, and rye).

(2) Summer cereals (maize, teff, kaffircorn or summer rye). Maize is not very effective, since the plants are somewhat susceptible. Teff, on the other hand takes a great deal of plant food out of the soil.

(3) Summer legumes (Sunn hemp and Groundnuts). These are the most effective crops so far found. Athough the plants are susceptible to a very slight degree, they may be utilized with a great measure of success and both these legumes can be recommended. Sunn hemp may either be ploughed in for green manuring or it may be cut for fodder.

Hemp has the disadvantage of requiring a long growing season and is, therefore, not suitable for the higher-lying parts of the Union. It is doubtful, however, whether serious attempts have been made to cultivate it to any considerable extent in these parts. Until such time as a substitue has been found, farmers will have to resort to either hemp or a summer cereal.

Grasses such as Rhodes Grass or Kikuya, cannot be recommended, since they do not offer effective resistance to the eelworm. We have a record of a tobacco crop which was severely infested when grown on a morgen of soil which had previously been occupied by Kikuyu grass for seven years. Rhodes grass has also been found to be unsatisfactory in other parts, e.g. in Rhodesia.

The period over which the rotation of crops extends is most important, since the longer the soil is under immune crops, the better are the prospects for effective control. Each farmer should apply that rotational cropping system which is most suitable to the specific conditions on his farm. Such a system, is, however, invariably beneficial because it incorporates more humus into the soil and improves its fertility.

(*a*) (1) Winter cereal and hemp in summer; (2) winter cereal and hemp in summer; (3) winter cereal and hemp in summer; (4) winter cereal and hemp in summer or a susceptible crop, such as potatoes, tobacco or vegetables. This means that after a series of

immune crops over a period of three years, a susceptible crop may be planted in the summer of the fourth year. This may even be tried in the third year on some farms. The hemp may either be cut or ploughed under depending on the need for fodder or green manure. A period of five years gives the best rsults, aftr which two or more susceptible crops may be cultivated consecutively, if necessary.

(*b*) Winter cereal and drying out in summer, ploughing of soil monthly, or every two months and eradication of weeds. The winter cereals may be utilized for green feed and the soil should then be ploughed from the middle of September. If the soil is heavily infested, a repetition of the drying out in summer is recommended for the second year; and in the summer of the third year a susceptible crop may be planted. It is also essential that farmers should incorpotato as much humus into the soil as possible. Wind will be an important factor in impoverishing sandy soil, and farmers are advised to excercise great care with such soils.

(*c*) Schemes (*a*) and (*b*) above may, of course, be combined by allowing the soil to dry out one summer and planting it with hemp the next. During the next summer or the one after that, either drying out may be applied or else hemp and winter cereal may be planted; alternatively the soil may be left to lie fallow in winter. After this a susceptible crop may be sown.

(*d*) Maize and other summer cereals may be substituted for hemp or drying out, followed by a winter cereal or winter fallowing, but it has been proved that the summer cereals are less effective than hemp in counteracting the eelworm.

In all cases, the crops must be sown or planted as densely as possible in order to exclude weeds. The drying-out method is the one which will yield the earliest and best results and should be applied wherever possible, even in flower and vegetable gardens.

In gardens the problem is to control the eelworm where the plants cultivated such as vegetables and flowers are very susceptible.

Pratically all varieties of vegetables and flowers are susceptible to the eelworm. In small beds, the cyanide and ammonium sulphate method may be successfully applied and will prove very beneficial, but the costs entailed by this method when applied on a large scale, are prohibitive.

Vegetable and flower growers will be well advised to apply a system of rotational cropping or to dry out or fallow the soil as much as possible. In addition it will be necessary for them to treat their seed beds with cyanide or to supply any other method calculated to control the worm.

Control in infested orchards is exceedingly difficult. In such orchards the trees must be well fertilized and as much chaff, straw or similar vegetable matter as possible should be incorporated into the soil; or otherwise a cover crop such as hemp should be sown between the trees and ploughed under.

Nurserymen should be on the lookout for this pest, for many fruit and ornamental trees are attacked by the eelworm. They should plough the soil annually or dig up the soil deeply so as to keep it as free from infestation as possible, particularly for the cultivation of young trees. Frequently soil placed in pots or tins for transplanting trees or shrubs, is severely infested and growers are urged to be extremely conscientious in controlling this pest in nurseries. The soil used in such pots or tins can easily be sterilized by placing it on iron sheets over a fire and heating until the soil is thoroughly hot.

Sterilization is not injurious to soil, and humus and other fertilizers can easily be re-introduced into it afterwards.

Utilizing Lucerne as Stock Feed.

H. P. D. van Wyk and W. A. Verbeek, Animal Husbandry Officers, Vaal-Hartz Experiment Station.

THE importance of fodder reserves for stock feeding has already been stressed by the Department on many occasions. Nevertheless, a shortage of certain feed supplies is to-day being experienced. As a result of this state of affairs, it has become essential to pay more attention to making provision for feed reserves as well as to make the best use of available feed varieties. This requires a thorough knowledge of their nutritive values as well as the nutrition requirements of the various classes of farm animals.

During certain times of the year, especially during winter, certain areas over the greater part of the country experience a deficiency of nutrients in natural grazing. Proteins, which play an important part in the maintenance, development and production of animals, belong to the chief and usually most expensive feeds. In many cases where sufficient feed is apparently being supplied, it is nevertheless found that the growth and condition of the animals are unsatisfactory. In most of these cases such a condition may be attributed to a deficiency of proteins in the feed. This protein deficiency may be effectively and economically supplemented by utilizing legumes which are rich in high-quality protein.

Value of Lucerne.

Although the value of legumes such as lucernê, cowpeas, vellvet beans and soybeans when used as roughage, is essentially the same, this article will be devoted solely to the usefulness of lucerne, which, in addition to its value as a protein concentrate, possesses the property of facilitating the digestion of other varieties of roughage, especially teff.

Lucerne is grown in many parts of the Union, especially on suitable soils under irrigation. Where conditions have proved favourable, the cultivation of lucerne under dryland conditions has greatly increased. Given suitable conditions, lucerne yields a large quantity of feed of excellent value which can be used for feeding purposes in the following familiar forms, viz.: hay, lucerne meal, silage, and as pasturage

Lucerne Hay.

According to Turpin and McKellar, the maximum crude-protein content of S.A. commercial lucerne hay is 20 per cent., the lowest 13·69 per cent., and the average approximately 16 per cent. The following table gives a comparison of the quantities of digestible crude protein in the various farm feeds:—

	Digestible nutrients per 100 lb. air-dried material.		Average normal yield of digestible protein per morgen.
	Crude Protein.	Total digestible substances.	
Lucerne Hay............	10·6	51·6	1,696
Teff Hay...............	4·6	52·2	276
Cowpea Hay............	12·6	49·4	756
Maize-Cob Meal.........	6·0	75·9	240
Groundnut Meal..........	38·0	82·1	—

Lucerne Meal.

Lucerne hay is ground and marketed as lucerne meal. Lucerne in this form is used mainly in feed mixtures for poultry and pigs. Under present conditions, however, lucerne meal has come to play a more extensive part since it may be substituted for wheaten bran, which is no longer obtainable. When lucerne is used in the form of meal, less waste takes place than with lucerne hay, and it is claimed that this meal is more digestible. Under normal conditions, however, the cost of grinding the lucerne hay will not justify the use of lucerne meal. There is also the danger that commercial lucerne meal may be made from inferior lucerne hay. The nutritive value of lucerne meal will, therefore, vary considerably and the consumer will not be able to determine the quality of lucerne meal as readily as in the case of lucerne hay.

Lucerne Silage.

As indicated in the foregoing table, good quality lucerne hay contains a considerable quantity of digestible crude protein. In addition, a larger quantity of digestible crude protein per morgen is obtained than from any other variety of farm feed. There are times, however, when it is not possible to make lucerne hay of good quality, e.g., during rainy weather. Considerable loss will result if in such circumstances lucerne cannot be preserved in some other form. Making silage of lucerne will not only prevent such loss, but will also be an even more effective way of preserving the constituents than by making lucerne hay of good quality, as is reflected in the following table:—

On Air-dried Basis.	Percentage.				
	Ash.	Fat.	Crude Protein.	Crude Fibre.	Carbo-hydrate.
Analysis of :—					
Green Lucerne..........	10·85	1·64	20·84	34·38	32·20
Lucerne Silage..........	10·73	2·57	19·69	34·01	33·00

(Taken from Lucerne in S.A.—see references.)

Another advantage of this form of feed is that it produces succulent feed during difficult times, e.g., during winter. Succulent feed is of special importance in the feeding of dairy cows.

Recently the ensiling on a large scale of legumes and other protein-rich crops was successfully carried out, but since many farmers are not yet fully acquainted with the process of ensiling such crops, comparatively little use is being made of lucerne silage even at the present time. During the past few years, large quantities of good quality lucerne silage have been made at the Vaal-Hartz Experiment Station, which were readily consumed by the farm animals. For the guidance of farmers not yet familiar with the method of ensiling lucerne, a brief description of the processes carried out at the Vaal-Hartz Experiment Station is given below.

The lucerne is cut as near as possible to the 10 per cent. flowering stage, i.e., the same stage at which cutting is most advantageous for haymaking purposes. If possible, the lucerne should be cut and carted away during the coolest part of the day. In many cases, however, practical difficulties necessitate working throughout

the day, with the exception of a few hours' break during the hottest part of the day. In such cases it is desirable to arrange the cutting of the lucerne so that there will be no accumulation of cut lucerne on the land, the newly cut hay being transferred to the silo as soon as possible.

The preservation of crops in the form of silage is usually effected by means of acetic and lactic acids formed by bacterial action on the starches and sugars of the plant itself. Lucerne and other protein-rich fodder crops do not contain starches and sugars in adequate quantities for the formation of enough acid for their preservation. Consequently, this deficiency must be supplemented in order to prevent rotting. Excellent results have been obtained with molasses; yet the same measure of success can be achieved by using other materials such as, for instance, a mixture of green maize and lucerne, mealiemeal, and also certain acids. The material used, will depend upon what is cheapest in the circumstances.

When molasses are used, excellent results are obtained with an application of 3 per cent. molasses (60 lb. molasses to 1 ton green lucerne). Before application, the stated quantity of molasses is diluted in 10 gallons of water. If the green material is in a wilted condition, more water in proportion to the molasses may be used. In order to determine the proportion of lucerne to molasses under practical conditions, it is necessary to know the approximate weight of the wagon loads of green lucerne. From this it will be possible to determine the quantity of molasses required for each load. Where a farmer has a chaff cutter at his disposal, he will be able to calculate the length of time required to cut up a load of green lucerne, and from this he can determine the time required to cut up one ton of lucerne. The diluted molasses may be added as each ton is cut up. For example, if it takes 20 minutes to cut up a ton of lucerne, the diluted molasses required for a full ton should be spread evenly over the cut material during the last ten minutes, i.e., while the second half of a particular ton of lucerne is being cut. The usual precautionary measures are necessary, such as packing the material compactly enough to exclude air, and sealing the silage so that no air can penetrate from the top.

To ensure the production of good silage, it is better to use too much molasses than too little.

Lucerne Grazing.

Many farmers make use of lucerne as a pasture crop for various classes of farm animals. The advantages derived from this practice are obvious, since lucerne is then used in its natural form, whereas, when used in the form of hay or silage, there is always a certain loss of nutrients. By putting animals to graze on lucerne, labour costs entailed in the making of lucerne hay and silage are also ruled out. In addition, manure, so necessary as a fertilizer, is spread on the land in a natural way. Unfortunately, owing to the risk of losing animals through bloating, grazing of lucerne cannot be made a general practice for cattle and sheep. Various preventives against bloating are employed in different parts of the country, but no generally effective measure to prevent bloating has as yet been discovered.

Where lucerne is grazed, there is also the risk of the stand becoming damaged and the life of the plant being shortened. It is, therefore, essential for the farmer to exercise judicious controll when grazing lucerne.

Feed Requirements of Animals.

The extent to which the above-mentioned forms of lucerne are put to use, will depend upon the requirements of the various classes of farm animals. The feed requirements of all classes of animals go, in the first place, for maintenance, and only thereafter for production (milk, meat, wool, etc.).

Cattle.—According to the feeding standards of Henry and Morrison, the feed requirements for the maintenance of a full-grown dairy cow of 1,000 lb. live weight are:—

Digestible proteins	0·600 lb. per day.
Total digestible nutrients	7·000 lb. per day.

Where no other cheaper roughage is available, 15 lb. of lucerne hay will satisfy the above requirements. In order to provide proteins for maintenance purposes during that time of the year (winter) when an appreciable deficiency of proteins occurs in natural grazing, 5 lb. of lucerne hay or 20 to 25 lb. of lucerne silage per head per day as a supplementary feed will satisfy these requirements.

Should the feed for young growing animals be deficient in proteins, the result will be not only a deterioration in condition, but also a slowing down of the normal growth of the animal. The protein requirements of young growing cattle are fairly high compared with those of full-grown animals, and differ according to the age of the animals; but for practical purposes, the quantities of hay and silage as given above will be adequate.

In the case of milk-producing cows, provision must be made for the nutrients necessary for milk production in addition to those required for maintenance. These requirements will depend upon the quantity and quality of the milk produced. Some of the rations described below contain lucerne hay and roughage with a low protein content from which it will be evident what advantages are attached to roughage rich in proteins.

The minimum requirements for a cow weighing 1,000 lb. and producing 3 gallons (30 lb.) of milk containing 3·5 per cent. butter-fat per day, are: digestible proteins, 1·74 lb. per day, and total digestible constituents, 15·52 lb. per day. These requirements will be provided by:—

		Digestible Proteins.	*Total Digestible Proteins.*
(1)	30 lb. lucerne hay............	3·18	15·48
(2)	38 lb. teff hay..............	1·75	19·84
(3)	20 lb. teff hay............ 10 lb. lucerne hay..........	1·98	15·60
(4)	20 lb. lucerne hay.......... 7 lb. maize-cob meal......	2·54	15·63
(5)	20 lb. teff hay............ 5 lb. maize-cob meal...... 1·5 lb. groundnut meal.....	2·79	15·47
(6)	13 lb. teff hay............ 7 lb. lucerne hay.......... 7 lb. maize-cob meal......	1·76	15·71

Although 30 lb. of lucerne hay (1) satisfy the requirements, a large percentage of proteins is wasted so that the ration is unbalanced. Where the feed consists of teff hay only, 38 lb. will satisfy the requirements. In this case the feeding ratio is better, but the quality of the proteins is much lower, while the quantity of dry material greatly exceeds that necessary for normal consumption.

The combination of lucerne and teff as in (3) provides the necessary nutrients and results in a better balanced ration. When the

feeding of lucerne hay or teff hay becomes restricted, it will be necessary to supplement the requirements with concentrates, e.g., in the case of (4) and (5). In the case of teff hay, however, the inclusion of a protein-rich concentrate in the ration is essential, which is not so necessary in the case of lucerne hay. If roughage in the form of lucerne hay is, however, supplied together with non-leguminous roughage, a reasonably well-balanced ration, as in (6) can be fed without the addition of a protein-rich concentrate.

The minimum requirements for a cow weighing 1,000 lb., and producing 5 gallons (50 lb.) of milk per day with a butterfat percentage of 3·5 are: 2·5 lb. digestible proteins, and 21·2 lb. total digestible nutrients per day, which will be provided by:—

		Digestible Proteins.	*T.D.N.*
(1)	20 lb. lucerne hay 15 lb. maize-cob meal	3·02	21·71
(2)	20 lb. teff hay 12 lb. maize-cob meal 2·5 lb. groundnut oil-cake meal	2·69	21·60
(3)	7 lb. teff hay 13 lb. lucerne hay 14·5 lb. maize-cob meal	2·57	21·37

Purely on the basis of these figures, therefore, it will not be necessary even in the case of a 5-gallon cow to include a protein-rich concentrate in the ration when lucerne hay is available, as is evident from the foregoing rations; yet the addition of an animal protein concentrate, such as meat meal and fish meal, always increases the value of a ration owing to the high biological value of such proteins, and the additional essential amino-acids which this provides for the animal. It is, therefore, of special importance in the rations for high producers.

Although maize-cob meal is given in the above rations, mealies are usually substituted in milk-production rations since too much energy is expended with the digestion of the fibre in cob meal, and because cob meal has an adverse effect on the digestion of proteins.

Lucerne in some other form may be substituted wholly or partially for lucerne hay in the ration for dairy cows. As already pointed out, lucerne silage is especially important in this respect, and can be substituted in the ration for lucerne hay in the proportion of 4 lb. lucerne silage to every 1 lb. of hay. This proportion will vary, however, according to the moisture content of the silage.

Fattening of Oxen.—Where fattening rations are used to finish off slaughter oxen, lucerne will supply the necessary protein requirements in an economical way and render the inclusion of a protein-rich concentrate in the ration unnecessary. For instance, in a ration consisting of 10 lb. mealie meal, 12 lb. teff hay and 5 lb. lucerne hay, as against 10 lb. mealie meal, 17 lb. teff hay and 1 lb. groundnut meal, an amount of 5 lb. lucerne hay will serve as a substitute for 5 lb. teff hay plus 1 lb. groundnut meal per day.

Sheep.—During winter and times of drought, lucerne is valuable as a supplementary feed for maintenance purposes, and can be used as given in the following rations (taken from Drought Rations for Sheep, *Farming in South Africa*):—

(1) When the nutritive value of natural grazing begins to decrease during winter and it becomes necessary to supply supplementary feed, 2 to 3 oz. of lucerne hay per sheep per day will initially serve as an adequate supplementary feed. When the quality

of the veld and the condition of the sheep require it, the farmer can increase these quantities.

(2) In the case of the farmer who has spineless cactus available, ½ lb. of lucerne hay per sheep per day will be adequate, provided the sheep have free access to the cactus. The farmer will find this cheaper than to provide a supplementary feed of maize or groundnut meal.

(3) When no grazing is available, the feeding of the following rations in the kraal will be most satisfactory: 1½ to 2 lb. lucerne hay per sheep per day, or 1 lb. lucerne hay plus ½ lb. maize per sheep per day.

Horses.—In rations for horses, good quality lucerne hay may be substituted wholly or partially for other roughage. Since horses are not liable to become bloated, lucerne can be used more economically in the form of grazing.

Pigs.—For feeding pigs, lucerne is the best roughage that can be included in their rations, and can be fed in various forms. As lucerne hay, it can be supplied to the pigs in suitable racks. If fed in the form of lucerne meal, it can be included in the concentrate mixture, while at the same time serving as a substitute for the wheaten bran in the ration. In this case, lucerne meal should constitute more than 15 per cent. of the ration. Lucerne is pre-eminently suitable as grazing for all classes of pigs, since, in addition to its protein content, it is rich in readily assimilable mineral substances (lime and phosphates). A better and more rapid increase in weight is usually obtained by making use of lucerne grazing, and besides these advantages the cost of production is reduced since the grazing can be substituted for approximately one-third of the ration in the case of a young growing pig, and for approximately two-thirds of that of a dry sow. For the production of baconers lucerne grazing can be provided until the pigs have attained a weight of approximately 150 lb., subsequent to which they are finished off for the market in pens or dry camps.

Successful Experiments.

At the Vaal-Hartz Experiment Station important and promising results have already been obtained with experiments in which different forms of lucerne were used for milk production, fattening of oxen, fat lamb production and fattening of sheep. These results will be dealt with in separate articles shortly.

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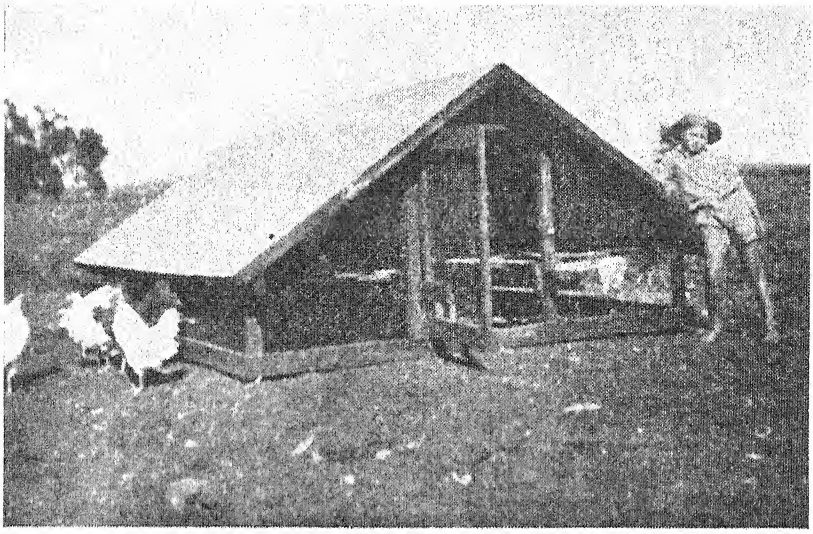
Movable Poultry Houses.

P. J. Serfontein, Professional Officer (Poultry), College of Agriculture, Potchefstroom.

IT is a generally recognised fact that the majority of the failures experienced in poultry-farming are due to inability on the part of the poultry farmers concerned, to fill their permanent lay-houses with well-developed, healthy pullets towards the end of January and the beginning of February. For poultry-farming to be profitable, a high percentage of the annual egg production should be laid



A Movable Poultry House. Note that the perches are higher than lowest point of the roof.

in the period between February and June. In order to make this possible the chicks must be hatched during the period extending from July to the middle of September and afforded every opportunity for proper development. Most poultry farmers succeed in obtaining a satisfactory egg production if their birds with which they start are healthy. To get good egg production from pullets during the winter months is, however, much more difficult. Chicks which have once suffered a setback, will seldom develop into profitable layers.

One of the reasons why the production of pullets frequently meets with failure, is that too many chicks are kept together in runs, with the result that they are overcrowded during the growing period. The brooder-house should provide ample space for the chicks until they are 6 to 8 weeks old, when they may be removed. By this time it is necessary for the cockerels and pullets to be separated. As soon as the chicks are well covered with feathers, they may be housed in shelters up to the age of 4 or 4½ months. In certain respects these shelters are superior to the brooder-house during summer. The chicks make better growth and are healthier where their numbers are kept within reasonable limits, the houses are well-ventilated, and natural shade is available.

Advantages of Movable Houses.

Overcrowding the brooder-house results in poor growth and stunting and predisposes the young birds to such diseases as colds,

etc. The onset of egg-production of such pullets is seriously retarded, with the result that when they come into full production, the period of egg-scarcity will be past and prices will have fallen considerably.

Another advantage of movable summer shelters is that they make it possible for chicks to be raised on clean, fresh soil every year. Internal parasites such as round worms and tapeworms are common where poultry are kept. The most practical and economical control of internal parasites lies in preventing infestation of the chicks. This is possible only if chicks are reared away from mature birds on soil which has not been occupied by poultry for at least two seasons. This is, of course, practicable only if movable houses are available.

A further reason why movable summer shelters are indispensable to the poultry farmer in South Africa, is that there is a period every year (October to almost the end of February) when adequate housing is an acute problem on every poultry farm. After October the chicken houses soon become overcrowded. At that time the laying-houses are also still full of old birds, and February is sometimes well advanced before all culls are sold or killed to make room for pullets. The position is also aggravated by the large number of cockerels which are sometimes raised for the market or for breeding purposes. It is clear, therefore, that in order to prevent overcrowding of chicks or full-grown birds, it is essential that provision should be made for additional housing, which will necessarily have to be vacant for a portion of the year.

An Economical Poultry-house.

In view of the fact that after feeding, housing is the largest item on the expenditure side of production, the importance of economical housing will be apparent. The necessary additional housing cannot be furnished more cheaply and more effectively than in the form of movable summer shelters.

In view of the high costs of material under present-day conditions, the roofs of this type of house may be made of thatch or reeds —an expedient which is more likely to prove an advantage than a disadvantage.

Last, but not least, these shelters will enable poultry farmers to run their undertakings more economically. The use of these houses, for instance, will enable producers to feed simpler rations and the raising of chicks will, therefore, entail less expenditure. The protein is the most expensive portion of the ration and at present there is a serious shortage of this nutrient. The proteins in young green grass, wheat, oats, rye or lucerne, have a very high biological value. For this reason, as many chicks as possible should be raised on green grazing this year. Not only will the total consumption of feed purchased be reduced, but valuable proteins and vitamins will be provided in this way.

In addition to enabling chicks to be reared on clean soil away from older birds, the type of movable house illustrated below, which is in use at Potchefstroom, also represents the most economical means of raising chicks.

A Popular Bulletin for the Farmer.

Bulletin 234.—"Re-inforced Circular Reservoirs." Obtainable from the Editor, Department of Agriculture and Forestry, Pretoria, at 3d. per copy.

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* Price Review for September, 1942.

SLAUGHTER STOCK.—The ordinary seasonal rise in beef prices still continued, but was this year accentuated by the drought of the previous summer and the resultant shortage of forage. Prices during the past month rose exceedingly sharper and to such an extent that the Price Controller in consultation with the Food Controller, decided to fix meat prices. For further particulars regarding this, see article elsewhere in this issue.

Ordinary prime cattle on the Johannesburg market rose from 59s. 2d. per 100 lb., estimated weight *on the hoof*, in August to 65s. 4d. in September; good mediums from 53s. 2d. to 60s. 3d., and compounds from 43s. 2d. to 49s. 2d. On the Durban market medium cattle increased from 45s. 3d. to 53s. 8d. per 100 lb., dressed weight *on the hook*, and compounds from 31s. 9d. to 41s. 3d. As regards slaughter sheep, prime merinos on the Johannesburg market rose from 11·1d. per lb., estimated dressed weight on the hoof, in August to 12·1d. per lb. in September, and prime cross-breds from 10·0d. to 10·9d. per lb. On the Cape Town market prime merinos decreased somewhat, viz., from 10·6d. per lb. to 10·1d. in September, while prices of other classes remained more or less unchanged.

Foodstuffs.—These remained fairly scarce. Very moderate supplies of lucerne hay and teff hay were present on the Johannesburg market and sold at the maximum fixed prices.

Potatoes.—On all markets there were considerably less Transvaal highveld and Orange Free State potatoes. However, fair quantities of locally produced fresh potatoes as well as lowveld potatoes started to arrive. Nevertheless the supply was not sufficient and especially good fresh potatoes generally sold at maximum prices. National Mark Grade 1, No. 2 and 3 averaged 23s. 5d. and 23s. 9d. per bag on the Johannesburg market as against 21s. 4d. and 22s. 6d. respectively the previous month, while Transvaal No. 1 rose from 14s. 7d. per bag in August to 15s. 1d. in September.

Onions.—The Cape season is drawing towards a close and relatively small offerings of dry onions were on all markets. Supplies

consisted mainly of local green onions. Prices of dried onions, therefore, rose appreciably, e.g., Cape onions on the Johannesburg market advanced from 15s. 4d. to 20s. 7d. per bag in September and on the Cape Town market from 12s. 11d. to 18s. 10d. per bag.

Tomatoes.—Large consignments Lowveld tomatoes were a characteristic on all markets. A few markets at times were glutted. The warm weather caused some consignments to arrive in an overripe condition. Other consignments again were too green but were sound on the whole. Good quality sold well throughout and prices were more or less the same as the previous month. National Mark No. 1 on the Johannesburg market was 2s. 5d. per tray and ordinary 1s. 3d. per tray.

Vegetables.—On the whole somewhat smaller supplies reached the markets, and prices throughout remained firm. Squashes and marrows were abundant, while cabbages were also still present in fair quantities. Sweet potatoes realised relatively good prices, especially also as a result of the smaller offerings of potatoes. Pumpkins and cauliflower were scarce.

Fruit.—Cold-storage apples were practically the only kind of deciduous fruit present on the markets, while loquats began to arrive. As regards citrus fruit, Valencia oranges were predominant, while seedlings were present in fairly large quantities. Demand was good and prices remained more or less unchanged on the samehigh level as that of the previous month. Valencias were 2s. 3d. per pocket on the Johannesburg market, 2s. 2d. on the Cape Town market, and 2s. 6d. on the Durban market. Naartjies were scarce and dear. Prices of grapefruit and lemons on the whole also displayed a rising tendency. Pineapples, papaws and granadillas were abundant, and prices declined throughout.

Eggs.—Relatively large quantities were still offered and prices changed little or nothing compared with the previous month. New-laid on the Johannesburg and Durban markets were 1s. 2d. and 1s 4d. per dozen respectively.

Maximum Meat Prices Fixed.

In an article in the October issue of this journal it was indicated how prices of slaughter stock have increased appreciably since the outbreak of the war and what various measures were taken by the Government in co-operation with the Meat Control Board in order to stabilise the position in the interest of both producers and consumers. In spite of this, however, prices of all classes of slaughter stock continued to rise and especially since the commencement of spring a few weeks ago with the normal seasonal decrease in supplies of slaughter stock, prices rose to such an extent that in relation to prices of other agricultural products it reached an unhealthy level.

The Price Controller, therefore, in consultation with the Food Controller, decided to fix meat prices. Until then meat was the only important agricultural commodity of which the price has not been fixed. The main reason for this was the absence of grading facilities, as grading is a pre-requisite to price fixation. Therefore prices will initially only be fixed in the areas of the Witwatersrand, Pretoria, Cape Town and Durban, where grading is possible. Consideration, however will be given to extending the scheme to other centres as soon as a trained personnel becomes available. Since these four

centres, however, exercise a dominating influence on prices of stock and meat, it is accepted that in the meantime prices in other parts of the country will be governed by these fixed prices.

Maximum wholesale prices and maximum retail prices for the various grades of beef, mutton and lamb in the four areas were, therefore, announced by the Price Controller in the *Government Gazette Extraordinary* of 9th October 1942.

Since the marketing of livestock, except on the Durban market, is organised on a live-weight basis, it is impossible to fix maximum prices for slaughter stock as such. The table shown below, however, as presented by the Price Controller in his announcement of maximum fixed prices, will serve as an indication of the gross market prices (i.e., including marketing costs and railage) which livestock farmers can expect on the basis of the maximum wholesale prices as fixed and as specified in the first schedule of this notice:—

Wholesale Price.	Grade.	Gross Market Price which can be expected by producers for animals with dressed weight on the hook of:—		
		400 lb.	500 lb.	600 lb.
Cattle.		£ s. d.	£ s. d.	£ s. d.
2 13 6	No. 2	11 0 0	13 15 0	16 10 0
2 8 6	No. 3	10 0 0	12 10 0	15 0 0
2 3 6	Not graded	9 0 0	11 5 0	13 10 0
Sheep. In Cape Town Area.		30 lb.	35 lb.	40 lb.
		£ s. d.	£ s. d.	£ s. d.
$10\frac{3}{8}$ d.	Lamb No. 1	1 5 8	1 9 11	1 14 2
$10\frac{1}{8}$ d.	Lamb No. 2	1 4 5	1 8 5	1 12 6
$9\frac{7}{8}$ d.	Mutton No. 1	1 3 9	1 7 9	1 11 8
$9\frac{1}{8}$ d.	Mutton No. 2	1 1 11	1 5 6	1 9 2

Although all beef, mutton and lamb will be graded, no prices have been fixed for the superior grades of beef (National Mark Super Prime, National Mark Prime and Prime) and for the superior grade of lamb (Super-Prime). These grades represent only a small percentage of our total meat supplies.

Index of Prices of Field Crops and Animal Products.

This index as shown elsewhere, rose from 140 in August to 145 in September. The most important advances occurred in:—

(1) The group "Other Field Crops", i.e., for potatoes, onions, sweet potatoes and dry beans, viz., from 175 to 191 in September. All four of these products showed advances in prices during the month.

(2) Slaughter stock which rose from 155 to 176 in September caused by the further considerable advances in price of especially slaughter cattle.

Monthly Index of the Volume and Sales and Prices of Deciduous Fruits.

NOTE.—This is the third instalment of a series of articles dealing with the sales and prices of fruits and vegetables on the most important markets of the Union, namely the eight municipal markets of Pretoria, Johannesburg, Bloemfontein, Cape Town, Port Elizabeth, East London, Durban and Pietermaritzburg. The first article concerned the four kinds of citrus fruit (oranges, lemons, grapefruit and naartjies) and appeared in the July 1942 issue of "Crops and Markets". The second article dealt with an analysis of the volume and sales of eight vegetables (potatoes, onions, sweet potatoes, green beans, green peas, tomatoes, cabbages, and cauliflower) and was published in the September issue of "Crops and Markets". The present article covers eight kinds of deciduous fruit, namely apples, pears, grapes, peaches, plums, apricots, nectarines and cherries. The period covered in each of these articles isfrom 1937 to 1942.

The annual and seasonal quantity and value of 8 kinds of deciduous fruit marketed on 8 markets in the Union is shown in the following table:—

Calendar Year.	1937. (1)	1938.	1939.	1940.	1941.
Quantity Sold: tons....................	20,390	24,610	25,700	24,780	22,890
Total value: £1,000....................	269·1	311·6	307·5	328·2	379·5
Season ( )...........................	1937/38	1938/39	1939–40	1940–41	1941–42
Quantity sold: tons....................	25,010	23,860	26,140	22,810	23,920
Total value £1,000.....................	309·6	296·2	322·6	365·8	472·7

(1) Partly estimated, first half of year not entirely complete.
(2) The season extends from October to September; it includes a relatively small quantity of storage apples of the previous season's crop and marketed from October to December.

It will be observed from the above that the volume of deciduous fruit sold on eight municiual markets from 1938 to 1941 or from 1937-38 to 1941-42 did not vary to any great extent and ranged between 22,000 and 26,000 tons. In fact, the volume marketed during the last two calendar years or seasons averaged less than the volume marketed during the two years or seasons preceding the outbreak of war. The aggregate value of the fruit sold, before the outbreak of war, averaged approximately £310,000 per annum. Since then, it has increased each year in spite of a reduced volume. By comparison, the aggregate sales, by weight, of deciduous fruit marketed represents approximately 45 per cent. of the quantity of citrus fruit marketed on the same markets (see "Crops and Markets" page 475). It should be mentioned, however, that substantial quantities of certain fruits consumed in certain cities (for example, apples in Johannesburg and grapes in Cape Town) are not sold in the auction markets. A comparison of the relative quantities of fruit consumed which is based on the above data would be misleading. This aspect of marketing has been dealt with at greater length in the articles previously mentioned.

Seasonal Supplies of Deciduous fruit.—The following summary indicates, for the Union as a whole, the beginning and end of the marketing season, in respect of each kind of deciduous fruit. The months given in brackets denote the months of heaviest supplies and

the approximate percentage sold in these months as compared with the sales of the whole season:—

Apples—January to December (March to June—60 per cent.).
Pears—December to August (January to March—70 per cent.).
Grapes—December to July (February to April—70 per cent.).
Peaches—October to May (December to February—80 per cent.).
Plums—November to March (December and January—80 per cent.).
Apricots—October to January (November and December—90 per cent.).
Nectarines—December to March (January—75 per cent.).
Cherries—October to January (November—70 per cent.).

Monthly Index of Sales and Prices.—The following table shows on an index basis, the weighted average monthly fluctuations in the volume of sales and prices of the eight kinds of deciduous fruit sold on the eight municipal markets. Since the data of sales and prices are presented in the table on the basis of corresponding months, in order to eliminate seasonal fluctuations and the difference in the relative values of the various kinds of fruit as far as practicable, they are only comparable horizontally and not vertically.

Month.	1937–39 corresponding months = 100.						Monthly sales as a percentage of total sales (average 1938 to 1941).
	Volume of Sales.			Prices.			
	1940.	1941.	1942.	1940.	1941.	1942.	Per Cent.
January	130	116	82	86	110	189	15·4
February	109	94	99	98	124	170	16·5
March	98	96	112	105	135	151	18·3
April	107	94	115	102	136	146	13·3
May	120	98	141	94	116	129	9·2
June	125	74	130	101	142	140	4·6
July	86	103	136	122	118	146	3·0
August	71	94	65	125	125	173	2·5
September	57	86	62	134	134	158	1·9
October	89	117	—	124	119	—	2·0
November	151	102	—	116	143	—	4·5
December	83	72	—	136	179	—	8·8
Weighted Average	106	96	—	105	133	—	100·0

The above table indicates that the aggregate volume of sales was 6 per cent. higher in 1940 than the average sales from 1937 to 1939. Prices also increased during this year by 5 per cent. In 1941, sales were 4 per cent. less than pre-war and prices averaged 33 per cent. higher. For each of the months from January to September 1942, prices averaged considerably higher than for the corresponding months of 1940 and 1941. In January 1942 prices were 89 per cent. above the average prices for the corresponding months from 1937 to 1939. During this month the volume of sales was 82 per cent. of "normal". Nearly two-thirds of the annual marketings of citrus fruit is sold during the first four months of the year.

It is evident from the table that the weighted average price for 1942 is likely to be considerably higher than that of the previous year. The extent of the rise can partly be determined by comparing the prices on a seasonal basis. Assuming the average seasonal prices

(October to September) for the two seasons of 1937-38 and 1938-39 to equal 100, then the index of prices for 1939-40 would remain unchanged at 100 but would increase to 130 for the 1940-41 season and to 158 for 1941-42 season, that is, an increase of 58 per cent. above pre-war prices.

The following tabulation shows the average increase in the prices of deciduous fruit in the various municipal markets from 1937 to 1941. The three years, 1937 to 1939, represent the pase period and equal 100.

Year.	Pretoria.	Johannesburg.	Bloemfontein	Cape Town.	Port Elizabeth.	East London.	Durban.	Pietermaritzburg.	Weighted Average.
1937........	108	106	105	100	105	109	102	103	104
1938........	99	104	106	94	97	94	100	100	101
1939........	93	90	89	106	98	97	98	97	95
1940........	108	103	115	105	100	105	108	113	105
1941........	127	128	138	143	135	122	110	132	133
Relative importance of Markets on basis of volume of sales (per cent.)									
Average. 1938–1941...	11·1	39·6	4·3	21·8	7·2	4·6	6·9	4·5	100·0

The average price of eight kinds of deciduous fruit on eight municipal markets increased 33 per cent. in 1941 as compared with pre-war (1937-1939). The coastal cities, excluding East London, showed relatively the largest increases. In Cape Town prices were about 43 per cent. higher in 1941 than before the outbreak of war. The fluctuations in prices on the Johannesburg and Pretoria municipal markets correspond very closely. Approximately 40 per cent. of the aggregate volume of sales is handled by the Johannesburg market and about 22 per cent. is sold on the Cape Town market.

The following table shows the extent to which the prices of the eight kinds of deciduous fruit on the combined eight markets have fluctuated from 1937 to 1941. (1937-1939 = 100.)

Year.	Apples.	Pears.	Grapes.	Peaches.	Plums.	Apricots.	Nectarines.	Cherries.	Weighted Average.
1937........	110	98	106	103	102	106	103	108	104
1938........	97	101	101	103	106	96	94	97	101
1939........	93	101	93	94	92	98	103	95	95
1940........	106	107	104	95	117	127	91	150	105
1941........	132	143	117	137	173	190	120	329	133
Relative Importance of Deciduous Fruits on basis of volume of sales (per cent.)									
Average. 1938–1941...	34·8	13·5	24·4	19·3	5·3	1·9	·5	·3	100·0

One-third of the aggregate volume of sales constituted apples and one-quarter grapes. Apricots, nectarines and cherries are of minor importance. Of the more important fruit, grapes showed the smallest increase and pears the largest.

Index of Prices of Field Crops and Animal Products.

(Basic period 1936-37 to 1938-39=100.)

SEASON (1st July to 30th June).	Summer Cereals, (*a*)	Winter Cereals. (*b*)	Hay. (*c*)	Other Field Crops. (*d*)	Pastoral Products. (*e*)	Dairy Products. (*f*)	Slaughter Stock. (*g*)	Poultry and Poultry Products. (*h*)	Combined Index.
WEIGHTS.	19	13	2	3	34	6	17	6	100
1936-37	118	86	94	93	122	86	89	98	106
1937-38	89	106	112	118	98	112	105	107	101
1938-39	92	107	96	89	79	102	106	94	93
1939-40	86	106	77	93	116	105	106	89	104
1940-41	109	113	106	159	103	108	110	112	109
1941-42	121	132	145	205	101	131	134	163	124
1941-									
January	121	115	98	121	100	104	115	96	109
February	122	115	92	115	100	104	112	107	109
March	135	115	87	125	100	104	105	125	112
April	126	116	98	167	101	106	108	151	114
May	112	116	125	160	101	109	108	157	112
June	110	116	126	183	101	111	111	150	113
July	112	118	128	241	100	130	118	145	117
August	111	118	132	216	100	130	119	109	114
September	118	118	154	228	100	130	128	108	118
October	124	119	138	268	100	128	135	115	121
November	124	137	110	250	100	128	140	118	124
December	127	137	135	199	100	122	147	128	125
1942—									
January	131	137	126	180	100	122	144	141	125
February	132	138	125	168	101	130	140	147	125
March	126	140	140	175	101	130	134	168	125
April	126	139	151	170	102	130	129	175	125
May	158	139	188	181	102	154	132	203	136
June	159	139	207	186	101	154	140	218	138
July	159	140	183	184	166	167	154	163	143
August	159	139	181	175	115	167	155	130	140
September	159	139	182	191	115	167	176	133	145

(*a*) Maize and kaffircorn.
(*b*) Wheat, oats and rye.
(*c*) Lucerne and teff hay
(*d*) Potatoes, sweet potatoes, onions and dried beans.
(*e*) Wool, mohair, hides and skins
(*f*) Butterfat, cheese milk and condensing milk.
(*g*) Cattle, sheep and pigs.
(*h*) Fowls, turkeys and eggs.

Average Prices of Oranges and Pawpaws on Municipal Markets.

SEASON (1st April to 31st March).	ORANGES (Pocket).							PAWPAWS (Standard box).	
	Johannesburg.			Cape Town.		Durban.		Johannesburg.	
	N.M. Navels.	Other. Navels.	Other. Valencias.	Navels.	Valencias.	Navels.	Valencias.	N.M.	Other.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
1938-39	1 10	1 6	1 5	2 0	2 1	—	—	2 0	1 7
1940-41	1 9	1 7	1 6	1 11	1 10	2 4	2 1	2 2	1 9
1941-42	1 9	1 8	2 6	1 10	2 5	1 11	2 1	2 1	1 10
1941-42	1 9	1 8	2 6	1 10	2 5	1 11	2 1	2 1	1 10
1941—									
January	—	0 11	1 9	—	1 10	—	2 11	2 6	1 6
February	—	2 2	2 2	—	2 9	—	—	3 7	2 10
March	—	2 3	2 10	3 0	2 9	2 9	—	3 5	2 7
April	1 9	1 8	1 5	2 5	1 11	2 1	—	2 7	2 1
May	1 9	1 5	1 4	1 7	1 0	2 2	—	2 0	1 6
June	1 8	1 6	1 3	1 7	—	1 8	—	1 6	1 4
July	1 8	1 7	1 3	1 8	—	1 11	1 6	1 5	1 2
August	2 2	2 2	1 7	1 11	1 6	1 10	1 8	1 11	1 8
September	2 4	2 1	1 9	2 4	1 8	2 6	1 8	1 9	1 5
October	—	1 10	1 11	3 2	1 9	3 5	1 8	2 3	1 10
November	—	2 9	2 8	3 1	2 7	—	2 5	3 2	2 6
December	—	2 9	3 6	—	3 5	—	2 6	3 9	2 7
1942—									
January	—	2 6	3 8	2 10	4 7	—	3 11	3 3	2 1
February	—	3 11	4 5	4 7	6 10	3 9	5 8	6 4	3 3
March	—	3 7	2 11	6 6	5 10	4 3	5 6	4 1	3 1
April	2 1	2 0	1 10	3 4	5 0	3 4	2 6	4 0	3 1
May	2 4	2 3	2 1	2 3	2 3	2 6	1 2	3 8	3 1
June	2 3	2 3	1 9	2 1	—	2 6	1 11	2 11	2 5
July	2 5	2 5	1 11	2 1	—	2 8	1 0	2 8	2 2
August	2 11	2 8	2 3	3 0	2 4	3 6	2 4	2 2	1 8
September	2 5	3 3	2 3	3 4	2 2	4 0	2 6	2 1	1 6

Average Prices of Slaughter Cattle and Pigs.

Season (1st June to 31st May).	Beef per 100 lb. (a) Johannesburg. N.M. Prime.	Ordinary. Prime.	Good Medium.	Com-pounds.	(b) Durban. Medium.	Com-pound.	Pigs per lb. Live Weight. Johannesburg. Porkers, Prime.	Baconers, Prime.	Stores.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	d.	d.	d.
1938–39.........	41 9	39 0	36 3	31 7	33 0	27 4	5·3	6·2	4·9
1940–41.........	43 11	41 4	37 11	32 5	31 1	25 4	4·5	5·4	4·0
1941–42.........	55 5	52 0	47 4	38 4	40 3	30 9	5·1	6·6	4·5
1941—									
January......	45 7	42 11	39 6	34 7	32 2	27 7	4·8	5·7	4·0
February......	45 0	41 2	38 1	32 9	29 11	24 5	4·3	6·2	4·1
March........	40 6	38 3	35 5	29 7	27 11	21 4	4·2	6·1	3·6
April..........	42 4	39 10	36 3	30 1	29 10	25 5	4·2	5·6	3·8
May...........	44 6	40 8	36 10	30 9	29 4	22 1	4·2	5·6	3·9
June..........	43 9	41 2	37 6	32 8	32 2	25 9	4·3	5·4	3·7
July...........	46 5	44 5	39 10	33 5	34 6	29 11	4·6	5·6	4·0
August........	47 0	44 9	41 2	33 7	35 5	29 3	4·5	5·6	3·5
September.....	49 11	47 1	44 2	36 11	41 9	33 11	4·8	5·6	3·7
October........	56 5	53 6	50 1	44 11	46 1	34 8	5·0	5·6	4·2
November.....	68 4	63 2	55 5	42 8	51 4	36 4	5·5	6·2	4·8
December......	72 2	68 7	60 3	43 0	49 2	33 6	5·4	6·4	4·9
1942—									
January.......	63 2	59 6	54 1	43 5	45 1	29 3	5·6	7·0	5·6
February......	58 3	53 4	49 2	40 6	38 11	26 7	5·4	8·0	5·2
March.........	53 5	47 10	44 3	36 11	37 8	27 11	5·5	8·2	4·8
April..........	53 0	49 10	44 4	35 6	37 3	28 5	5·5	8·2	4·7
May...........	54 4	51 3	47 5	36 8	35 11	26 0	5·0	7·8	4·6
June..........	56 6	53 8	49 8	39 5	37 1	28 6	5·5	8·0	5·1
July...........	61 0	57 8	53 6	44 3	46 10	33 10	6·4	8·4	6·1
August........	62 5	59 2	53 2	43 2	45 3	31 9	6·6	8·6	6·0
September.....	69 9	65 4	60 3	49 2	53 8	41 3	6·8	8·5	6·4

(a) Estimated dressed weight of cattle as sold on the hoof. As reported by Meat Control Board.
(b) Dressed weight of carcase sold on the hook.

Average Prices of Sheep per lb. Estimated Dressed Weight.*

Season (1st June to 31st May).	Johannesburg. Merino Wethers. Prime.	Medium.	Persians and Cross Breds. Prime.	Medium.	Cape Town. Merinos. Prime.	Medium.	Capes and Persians. Prime.	Medium.
	d.	d.	d.	d.	d.	d.	d.	d.
1938–39..........	6·3	5·5	5·8	5·1	5·8	5·6	5·9	5·7
1940–41..........	6·7	6·1	6·2	5·7	6·1	5·8	6·3	6·0
1941–42..........	8·3	7·4	7·5	6·8	7·7	7·2	7·6	7·3
1941—								
January........	7·0	6·5	6·5	6·0	6·3	6·1	6·4	6·1
February.......	7·1	6·6	6·7	6·2	6·9	6·5	6·8	6·5
March..........	6·7	6·1	6·2	5·7	6·3	5·9	6·2	5·9
April...........	7·0	6·5	6·4	5·9	6·6	6·1	6·4	6·1
May............	7·1	6·5	6·6	6·0	6·0	5·8	6·3	6·0
June...........	7·1	6·6	6·6	6·1	6·3	5·9	6·5	6·2
July...........	7·7	7·0	7·2	6·6	7·0	6·7	6·9	6·6
August.........	7·6	7·0	7·1	6·5	7·1	6·7	6·8	6·6
September......	8·2	7·6	7·7	7·0	7·2	6·8	7·2	6·9
October........	7·4	6·7	7·0	6·3	6·6	6·4	6·8	6·6
November......	7·4	6·8	6·9	6·3	6·8	6·5	6·9	6·6
December.......	8·2	7·4	7·6	6·8	6·8	6·5	6·8	6·5
1942—								
January........	8·7	7·8	7·5	6·7	7·4	7·1	7·4	7·2
February.......	9·3	8·3	8·2	7·7	9·0	8·3	8·7	8·3
March..........	9·6	8·4	8·8	7·9	9·6	8·8	9·3	8·8
April..........	8·8	7·7	7·9	6·9	9·7	8·8	9·4	8·8
May............	9·1	7·9	8·1	6·9	9·0	8·3	9·0	8·4
June...........	9·7	8·2	8·6	7·3	9·4	8·8	9·6	8·7
July...........	10·3	8·9	9·4	8·0	9·9	9·2	9·9	9·2
August.........	11·1	9·3	10·0	8·5	10·6	9·7	10·3	9·5
September......	12·1	10·5	10·9	9·2	10·1	9·6	10·4	9·4

* As sold on the hoof. Reported by Meat Control Board.

FARMING IN SOUTH ... AFRICA

Vol. 17 DECEMBER 1942 No. 201

Editorial:

Activities of the Food Control Organization.

AT the end of a year it is customary to review the activities of the past twelve months in order to take stock of the results achieved. It will, therefore, not be out of place, in this case also to trace the achievements of the Food Control Organization since its inception in May, 1942, up to the present time.

It will be understood that the establishment of such a vast undertaking is fraught with numerous difficulties and unavoidable delays. Before the machinery can be set in motion, a programme of work must be framed, and the technical, administrative and clerical staff procured. Furthermore, allowance must be made for the fact that food control is a new development, altogether unknown in this country, and that there is consequently no previous experience on which it is possible to build. At present, however, the organization finds itself well established and the whole subject of food control is being tackled in a purposeful manner. Satisfactory progress has been made, as will appear from the following brief summary of the most important activities.

War conditions have served to stimulate an effort to provide for our needs, not only for the present, but for the post-war period as well. This will be of incalculable value to both producer and consumer. In this respect one calls to mind such matters as the standardization of fertilizer mixtures and concentrates; the fixing of grades for oats, rye and barley; the development of the inland market, and the application of the export grades to dried fruits, such as raisins, sultanas, currants and apricots; and the introduction of meat grades for the inland markets.

Formerly there existed approximately 300 different fertilizer mixtures, and farmers found it a nightmare task to decide just which mixture would be suitable for a particular crop growing in a particular type of soil. The number of fertilizer mixtures has now been reduced to 8. Since these have been carefully made up their composition will remain constant, and will meet all the requirements of the soil and the crops.

As regards concentrate mixtures, it is now essential that every mixture shall be of prescribed composition and must be registered. This measure not only prevents exploitation, but also makes it possible to control prices. Up to the present by far the largest proportion of protein-rich substances required for the concentrate mixtures has been imported, but owing to lack of shipping space, a serious shortage of these essential commodities has arisen. The Food Control Organization has, however, intervened by creating an organization which will supplement this shortage by importing from neighbouring states and introducing the pooling system. Bonemeal, which is of such importance in our stock-farming areas, will also be classed in the category of protein-rich substances. In addition, arrangements have been made whereby schoolchildren will assist in the collection of bones.

For a considerable time control has already been exercised over wheat and maize (and maize and wheaten products), but it has now also become necessary to control oats, barley and rye (and their products.) At present this control, with the assistance of the Wheat Industry Control Board, is of immediate importance, but the establishment of the grades which render control possible is of far greater value for the future, since marketing and distribution are much more effective when properly graded products are handled. Producers as well as consumers will, therefore, benefit directly from this measure.

With regard to dried fruits, arrangements have been made, with the assistance of the Dried Fruit Board, to develop our inland markets to absorb as much of the surplus as possible. These products are sold in the same grades which have been fixed for export and consumers in the Union are able to procure the best sultanas, raisins, currants and dried apricots at reasonable prices. There is every hope that an important inland market, built up in this way will prove to be a great asset in the future.

When fixing the meat prices it was also essential to determine grades for the inland market. Consumers are now becoming acquainted with the values and qualities of the various joints, with the result that in future, farmers supplying meat of high quality will be well rewarded, whereas indifferent producers will gradually be forced to exercise greater care in order to produce meat of satisfactory quality.

Some people regard these "grades" and "standards" as unnecessary and useless, but in the future they will prove to be of immense value to both producer and consumer. Standardization and stabilized prices go hand in hand. Take, for example, the "Canterbury Lamb" of New Zealand and the "Sunkist" oranges of California which have become world famous as a result of proper grading and standardization.

Another step in the right direction which will be of great value even in the post-war period, is the guidance given to housewives by the Food Committee in connection with properly balanced diets. There is nothing new about drawing up standard diets, but the progress which has been made in collaboration with the Department of Public Health, the Railway Administration and the Medical Research Institute, can be seen in the fact that, dietitians now indicate what vegetables and meats are to be included in a balanced diet instead of explaining the composition of such a diet in terms of calories, carbohydrates, proteins and vitamins. They have shown in the most elementary way how to combine the available foods so that the family will derive the greatest benefit from the diet. Contact is being made with the various organizations in the country, and with their assistance and support, guidance will be given to all sections of the community.

In the sphere of food production very important new courses of action have also been taken, and have opened up new activities which will be of a permanent nature. Sheer necessity has compelled producers to supply their own seeds, especially in the case of protein-rich feeds, teff seed, grass seed and vegetable seed. These products were formerly imported, but now the farmer is learning to provide for himself, and under suitable soil and climatic conditions is even producing a surplus with which to assist his fellow farmer.

In this respect, the field personnel have rendered the country a great service. One of their chief tasks has been to keep farmers

informed on how to maintain the level of production in spite of a shortage of the usual instruments of production which in many cases, are now unobtainable. Technical officers have, therefore, been called upon to give guidance in connection with the use of substitutes which can be manufactured or obtained locally. Compost, for instance, is already being made and used on a large scale; attention is being paid to the cultivation of fibre plants suitable for use in the manufacture of bags and rope; operations have been

MR. W. L. DU PLESSIS. †

The Department has lost a conscientious officer and a real friend through the death of Mr. Willem Louw du Plessis, Under-Secretary for Agriculture and Forestry. He died suddenly on his way home on the afternoon of Wednesday, 4th November, after his day's work had been done.

The late Mr. du Plessis was born in the Paarl district, and in 1902 entered the Cape Civil Service as a clerk. In 1912 we find him in the Census office in Pretoria and in 1917 he was appointed to the staff of the Prime Minister's Office, where he had the honour of serving under three Prime Ministers, viz., Gens. Botha, Smuts and Hertzog.

In 1926 he was transferred to the Dept. of Agriculture as Parliamentary Clerk. Later he became senior clerk in the Division of Plant Industry and then Principal Clerk in the Division of Veterinary Services.

In 1934 he was promoted to the post of Administrative chief clerk at the Head Office of the Department, and in 1940 he was appointed Under-Secretary.

Through his wide experience and intimate knowledge of Civil Service affairs he was a well-known figure, while his affable disposition and unassuming nature made him a friend of officers, and his devotion to duty an example to all.

The Department herewith wishes to tender its heartfelt sympathy to his family in their sad bereavement.

commenced for the exploitation of the Langebaan rock phosphate deposit; machinery for expressing oil from soybeans is being gradually imported; imported seed potatoes are being planted on a large scale on crown lands for subsequent distribution amongst farmers; grain bags are being collected and it is hoped to have adequate numbers for the next crop; as far as possible, fruit and butter boxes are being made of local wood and supplied to farmers; and local firms are being assisted and encouraged in the manufacture and repair of milk cans and simple farm implements.

Another problem which is receiving the attention of an inter-departmental committee, is the shortage of native and coloured labour. Arrangements have already been made with public bodies to suspend less essential works, in order to release more labour for employment by producers. In Government works, Italian prisoners

of war are being utilized wherever possible. Prisoners of war have also been made available to farmers in groups of 2 or more. A new camp for prisoners of war has been set up at Worcester, to enable farmers in the Western Cape Province to select suitable labourers. Incidentally, it may be stated that, according to the experience of persons who have had Italian prisoners of war in their service for an appreciable period, these men seem to make good and reliable workers.

A problem which, even in pre-war times, gave rise to much difficulty, is the question of proper marketing and distribution of products. Up to the present, attention has, for the greater part, been concentrated on the rationing of maize—an expedient which is very necessary, since last year's crop was poor and it is now imperative to ensure in the first place that adequate supplies will be available for human consumption. The remainder of the maize is being systematically distributed among those producers who require it most and are able to utilize it to the best advantage. The distribution of protein-rich substances will also become a function of this section.

In so far as the prices of products are concerned, farmers have little cause for complaint. On the contrary, the marketing problem is practically non-existent. The marketing of certain perishable products, such as potatoes, onions, meat, eggs, etc., may, however, be very adversely affected by seasonal fluctuations; the prices may fall to a very low level in times of plenty, or soar to excessive heights in times of scarcity. With a view to keeping the price level within reasonable bounds and on a relatively stable basis, the Purchasing Section has undertaken to supply the military camps with meat, onions and potatoes bought from individual producers as well as on the open market. By buying surplus quantities in times of plenty and storing these for times of scarcity, the market is kept as steady as possible.

The Publicity Section disseminates through the medium of a series of articles in the press and on the radio, all information likely to be of value to the producer and consumer. The literature of this publicity series is supplied to all members of the field personnel and to approximately 1,000 farmers' associations. Interested organizations which do not receive this publicity series may apply to the Director of Publicity, Food Control Organization, Union Buildings, Pretoria.

It is almost impossible in a brief review, such as this, to furnish full particulars in regard to all the activities of this vast organization, but enough has been said to make it clear that an essential service of national importance has been undertaken and that good progress has been made in the comparatively short period of 8 months.

No matter how dark the future appears, there is ground for confidence, if the problems which the New Year will bring are tackled with courage and determination.

(Dr. J. S. Marais, Director of Publicity.)

Bloating in Ruminants.

Its Development and Control.

Dr. J. I. Quin, Onderstepoort.

FROM time to time bloating, also known as hoven, may suddenly occur in ruminants such as cattle, sheep and goats, usually soon after they have eaten green lucerne, and to a lesser extent after they have eaten other legumes. Since this condition may prove fatal, frequently without any previous warning of the danger, there is a constant possibility of loss occurring among stock which are fed

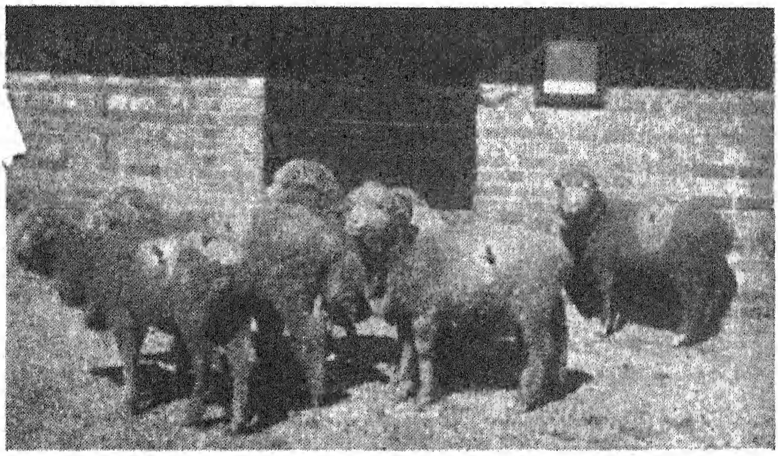

Fig. 1.—Sheep with fistula tubes in their rumens.

or allowed to graze on green lucerne. Consequently great care must be taken in the free use of an otherwise excellent fodder plant like lucerne, particularly when green and during the growing stage. In view of this danger, stock-owners are frequently compelled, when feeding their animals, to use lucerne only in the dry form, since lucerne hay is usually a much safer feed.

Haymaking however, increases production costs, and there is the further consideration that, unless special precautions are taken, the nutritive value of the plant may be appreciably reduced as a result of bleaching, fermentation and especially, loss of leaf material.

Causes of Bloating.

In so far as the actual cause of bloating is concerned, no definite conclusions have as yet been arrived at, except the general observation that both the condition of the lucerne and the peculiarities of the animal itself are contributory factors. Thus, for example, it is known that the bloating capacity of lucerne, even of plants on the same soil, may vary greatly at different times and that this quality is, therefore, closely associated with a change in certain processes occurring in the living plant. It is also known, however, that certain animals are very much more susceptible to hoven than others, even when grazing on the same field of lucerne. In view of the absence of data with regard to the cause of these peculiarities, both in the plant and in the animal, effective control of hoven in ruminants is exceedingly difficult.

In spite of the fact that the life of animals may occasionally be saved by the timely puncturing of the rumen, or by dosing, there is, nevertheless, the constant danger of sudden fatal cases of hoven in animals grazing on lucerne.

With the object of studying conditions in the digestive system of ruminants more closely, a series of experiments were carried out at Onderstepoort during the past few years on full-grown merino sheep. A fistula tube, which could be controlled by opening or closing it, was inserted into the rumen of each animal, high up on the left side of the body. (Fig. 1.)

These tubes made possible the repeated removal of fresh samples of the ruminal contents for examination. Furthermore, it was possible to introduce test material directly into the rumen, without difficulty, with a view to following the digestive processes step by step.

These experiments brought to light a large number of interesting facts, the most important of which are briefly summarized below.

(1) The Generation of Gas in the Fore-Stomachs.

The sudden occurrence of large quantities of gas in the rumen, shortly after the ingestion of feed, is exclusively due to the presence of sugars in the feed. This sugar is subject to a very rapid process of fermentation, which reaches its peak within a few minutes and is followed by an equally sudden falling off in the production of gas. None of the other nutrients, such as starch, fibre, protein or fat, undergo a similar process of fermentation. It was possible for accurate determinations to be made of the quantities of gas liberated in the fore-stomachs of various animals under different feeding conditions, and in this way it was proved that the sudden generation of gas in animals fed on a lucerne ration is far in excess of that occurring in animals fed on dry veldhay, the latter being very slight in most cases. The quantity of gas which is produced immediately the sugar starts fermenting, is in direct proportion to the sugar content of the plant. It was also found that the sugar content of green lucerne varies considerably—a fact which may be associated with the climate and other circumstances. This in itself is an important aspect of the problem, and is the subject of further investigation.

(2) The Cause of Sugar Fermentation.

The feed in the rumen of ruminants is subjected to the action of millions of bacteria and other organisms which find conditions in this part of the animal body exceptionally favourable for their development. Some of these types of bacteria are of the utmost importance, since they alone are responsible for the digestion of cellulose and other fibrous substances which constitute such a large and otherwise not readily available portion of the animal's feed. The general composition of the so-called bacterial flora of the fore-stomach is determined not only by conditions prevailing in that organ but also, and to an even greater extent, by the nature of the feed and the bacterial infection which normally occurs on it. It is, therefore, readily understandable that the different types of bacteria as well as the numbers in which they occur and their mutual relationship are subject to marked changes. As regards the rapid fermentation of sugar, it was proved that it is mainly, if not wholly, due to a specific yeast. The egg-shaped cells of this yeast, which has been named *Schizosaccharomyces ovis*, are encountered in enormous

numbers, particularly in the stomach contents of sheep subsisting mainly on a lucerne ration. There is every indication that it must be regarded as a normal bacterial infection on lucerne and possibly also on other plants, and is, therefore, constantly ingested together with the feed, wherever it occurs. These yeast cells are particularly dependant on sugar as a part of their regular substance, both for

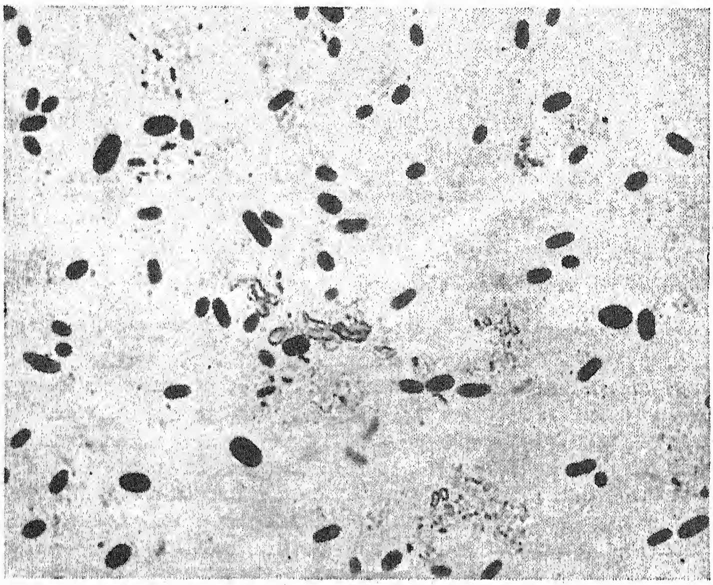

Fig. 2.—Yeast cells (magnifiied 640 times) in the rumenal contents of the sheep, filled with reserve carbohydrate (glycogen) after the ingestion of sugar.

the maintenance of their energy and for their other vital needs. To that end, starved cells are able to absorb a portion of the available sugar rapidly and directly into their own cellular structure and store it up for a period in the form of reserve feed (carbohydrate) (Fig. 2). The remainder of the sugar undergoes an equally sudden process of combustion in these cells—a process which is accompanied by the liberation of a considerable amount of heat and carbon dioxide. According to the findings of these experiments, the extent of the heat generated may be sufficient to cause a rise of 1·5 to 2·5° C. in the temperature of the entire stomach contents of the sheep. As a rule the large quantities of gas formed in the rumen escape without any difficulty by way of the animal's oesophagus, thereby preventing any dangerous rise in pressure in the fore-stomachs, which may be caused by the rapid and extensive processes of fermentation taking place there. Although the yeast cells may multiply rapidly and under favourable conditions are likely to be encountered in the rumen in very large numbers, they are nevertheless comparatively sensitive, since several chemical substances, as well as starvation of the animal for as short a period as 24 to 48 hours, are frequently sufficient to destroy all the cells of this yeast. Once this has happened it takes at least two to three weeks even when the animal is fed on a lucerne ration, before the yeast cells are once again normally established in large numbers in the fore-stomach of the animal. In the meantime the fermentation of the feed, and consequently also the degree of gas development, is inclined to be slight. In addition, there are

signs of a temporary falling off in appetite, particularly in the case of certain individual animals.

Up to the present, no definite conclusions have been arrived at with regard to the significance of these yeast cells, although it has already repeatedly been proved that other and better-known yeasts of the genus *Saccharomyces* are capable of forming a whole series of valuable substances. Thus, for example, new proteins and also various vitamins of the B group which, according to our present knowledge, are of the utmost importance in the human diet as well as in stock feed, can be formed by these yeast cells. Further, it has already been established that in ruminants certain vitamins of the B group can undoubtedly be formed again in the fore-stomach. It is, therefore, evident that the yeast described above can play an important rôle in this connection. This matter will, however, be investigated more closely.

(3) Effervescence of the Stomach Contents.

In normal digestion the gas escapes from the fore-stomachs just as rapidly as it is formed in the fermenting mass. It has been determined, however, that in cases of hoven, a terrific amount of effervescence takes place in the stomach contents within as short a period as 30 minutes after hungry animals have been allowed to graze on lucerne. The stomach contents consist of a dense, watery froth in which large quantities of partly digested lucerne leaves and stems are discernible. Although the animal is able to get rid of the gas in the rumen, it is by no means able to belch foam. Consequently a rapidly increasing tension is set up in the fore-stomach, accompanied by stretching of the abdominal wall. The effervescence of the stomach contents is due mainly to the presence of saponine in lucerne. This group of chemical compounds which occurs in various plants possesses the property of enormously increasing the surface tension of water. If a watery solution of this substance is shaken up a dense foam is formed, the bubbles of which do not readily burst. The same features may be observed when fresh lucerne juice is shaken up, while the juice of other plants such as green grass, oats or barley shows only a slight tendency to form a froth and incidentally, does not cause clinical hoven in animals.

(4) The Practical Control of Bloating.

Having acertained that bloating constitutes a part of the normal process of digestion in the fore-stomachs and the effervescence of the stomach contents is due to fermentation of plant sugar caused by definite yeast cells in the presence of the foam-forming substance, saponine, the control of this condition becomes clearer. It should also be noted in particular, that the number of yeast cells in the fore-stomach varies in different animals and also according to the nature of the feed and that animals with good appetites, such as dairy-cows and lambing ewes, are more inclined to develop hoven when kept on lucerne grazing, than other animals. The most important precaution is, therefore, to keep hungry animals from gaining access to lucerne grazing. This will prevent certain animals from greedily eating lucerne, in such extensive quantities that the starved yeast cells in their fore-stomachs are given an opportunity to cause a sudden fermentation of the plant sugar and so bring about effervescence of the stomach contents.

By applying a system of mixed feeding in such a way, however, that the appetite of the animals as well as of the yeast cells can be partially satisfied before the green lucerne in ingested, the process

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Production of Grass Seed.

L. C. C. Liebenberg, Professional Officer, Division of Soil and Veld Conservation.

IN the past, grass and clover seed was for the most part imported, but to-day it is practically impossible to get supplies of seed from overseas. We are, therefore, compelled to produce our own seed. The crops for which provision should be made in this respect are the paspalums, Rhodes grass, rye-grass, especially Italian and perennial rye-grasses, Cocksfoot, *Phalaris*, and perhaps also Yorkshire fog and tall fescue as also clovers, especially wild white, red and subterranean clover. Most of these crops already play an important rôle to-day and will be used to an increasing extent in future as their value is realised and their importance in the farming systems of the various areas is discovered and appreciated.

Except in the case of *paspalum dilatatum,* there is already a serious shortage of seed of all the above-mentioned pasture crops. This shortage will make itself felt much more acutely within a year if the present situation continues. Limited quantities of these seeds are still obtainable from merchants and it would be wise to make use of this supply, if the seed is still sound.

An effort has been made to investigate the possibilities of seed-production in suitable areas. Very few farmers have paid any attention to seed production and although some are already self-sufficient in this respect, it seems as if most farmers are not inclined to produce seed at all. It is realised that it is somewhat difficult to fit in seed production with meat, milk and wool production, but this is true of all areas in which pasture crops are successfully cultivated, and farmers in one area can therefore not expect farmers in another area to produce seed for their needs. Seed production could perhaps be arranged for that time of the year when pastures can be rested, i.e., during the summer months when the veld can be utilized for grazing.

Produce Your Own Seed.

Since there must inevitably be a period of transition during which everybody will be expected to co-operate, farmers are urged to produce seed for their own requirements, for the present, at any rate. As soon as an adequate number of interested farmers have applied themselves to seed production, this undertaking can be left entirely to them. Not every farmer will become a seed producer, although this will be a paying proposition to develop. There is no reason why some of our farmers should not make a success of it as is the case in oversea countries. To-day prices are high, but even at pre-war prices, seed production should be a profitable undertaking if confined to the right areas and if correct methods are applied.

Any undue rise in seed prices will adversely affect the cultivation of pasture crops, and this would naturally be something which the future seed producers themselves would try to avoid.

Efficient handling of the seed (drying of crops, threshing and cleaning) is essential for successful seed production. This applies especially to large-scale production of seed, and in that case it is desirable to make use of machinery as far as possible.

In the past, the demand for machines to handle grass and clover seed was negligible, with the result that at present there are no such machines in the country.

The present situation makes the importation of these machines practically impossible and farmers will therefore have to depend on

machinery which they already have in use, such as mowers, self-binders, etc. In cases where small quantities are produced for personal requirements and perhaps also a little extra for assisting the farmer who is less fortunate, use can be made of a mower, or the seed can be hand stripped. Manual labour is utilized for the present production of most of the paspalum seed in this country.

When to Harvest the Seed.

Since most of the above-mentioned winter crops will run to seed shortly, it would be advisable to make a few general remarks at this stage for the information and possible guidance of farmers, although it stands to reason that in the circumstances we have very little experience in this direction.

After stock have been removed from a pasture with the object of enabling the grass to produce seed, the advisability of applying fertilizer (in an organic or other form rich in nitrogen) and loosening the soil must be considered. In the case of most pastures such treatment will be very remunerative. If the new growth appears to be uneven, it is advisable to cut the crop in order to obtain uniform growth. This will at the same time produce a hay of very high value, which will fully reward the extra attention. The above-mentioned grasses readily lose their seed; consequently, careful handling on the land and elsewhere so as to prevent loss of seed is absolutely essential, for upon this will depend not only the extent of the farmer's gain but also whether the enterprise will yield a profit at all. Harvesting time is a very limited period in the case of most grasses. For rye grasses, for instance, the correct stage of maturity has been reached if a few of the seeds remain in the hand when a bunch of seed-ears is lightly grasped without pressing or pulling; or when some of the seed can be caught in a hat waved lightly through the ears. In the case of cocksfoot the best time for harvesting is when a few seeds fall from the ears when the latter are lightly shaken—at the commencement of the yellow ripening stage.

The best time for cutting is early in the morning since the seed is then least liable to fall out when handled. It will be most satisfactory to pile the cut grass or sheaves into heaps while cutting or as soon afterwards as possible in order, as far as possible, to prevent loss of seed. In this state the seed can be dried for threshing, while guarding against possible loss through wind. Heat is liable to be generated in large stacks of unripe grass, and this must be avoided. The grass should be handled as little as possible not only on the land, but up to the stage when threshing takes place. When a threshing machine is not available the seed can be beaten out with sticks on a tarpaulin, in bags or on a clean floor.

There are various implements and machines for the handling of seed. In other countries, stripping is usually done by hand when production is on a small scale. The ordinary mower (with a seed-harvesting attachment) is often used. In addition, there are simple strippers which harvest the seed or seed ears in a box attached to the machine. Selfbinders are often used since the seed is well protected and preserved in the sheaf, where it ripens properly. There is also the "combine" type of machine by means of which the seed ear or the entire plant is cut and threshed while the machine is in motion.

Marketing the Seed.

Within limits, it is desirable to clean the seed as thoroughly as possibly before marketing it or selling it to merchants. Cleaning the seed may perhaps be undertaken by certain merchants in cases

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The Maize Stalk-Borer.

Division of Entomology.

THIS article is a brief summary of the practical results of three years of intensive investigational work carried out by C. du Plessis, B.Sc., and H. A. F. Lea, B.Sc., Entomologists at the Kroonstad Summer Cereal Research Station in the Orange Free State. A full report, in the form of a science bulletin, will be published as soon as conditions allow, but in the meantime it is hoped that the production of maize will be encouraged by the advice given below.

FIG. 1.—Maize Stubble cut open to show the overwintering borer in the root of the plant.

The maize stalk-borer is the most serious pest with which the maize farmer has to contend. It is estimated that an average-annual loss to the maize industry of 10 per cent. of the annual yield is caused by this pest. At an average price of 15s. per bag, this annual loss amounts to about £1,000,000.

As with most insect pests when once they are firmly established, it is not feasible to eradicate the maize stalk-borer, and all that can be hoped for is effective control. This means continual warfare against the insect. It is therefore in the interest of every maize grower to take

the long view of the problem and adopt a system of farming which will reduce the loss and enable maize farming to become a profitable undertaking.

Life History of the Borer.

Before discussing the control of this pest, it will be of advantage to enumerate some important points in the life history of the insect which indicate possible control methods:—

(1) In the early season, the female moths appear to prefer the oldest plants on which to oviposit.

(2) In the late season, the second-generation females select the youngest plants on which to deposit their eggs.

(3) Soon after hatching, the young larvae migrate to the open top of the maize plant.

(4) Migration of larvae from infested to uninfested plants takes place regularly.

(5) The larvae overwinter in the root of the maize plant.

(6) Migration of larvae from the stem of the maize plant to the underground root portion starts with the advent of cold weather.

In considering control of the pest the above points should be kept clearly in mind, and careful observations should be made in the mealie lands to see how the insect is developing and when control measures should be applied. In addition, it should be remembered that, on the whole, maize farming in the Union is conducted on extensive lines.

Control Measures.

The following recommendations are made after much careful investigation, the idea being that a system of maize farming should be adopted in which proper attention is given to stalk-borer control. It should be understood that the system, as outlined, is probably not the only one, but is merely intended as an indication of the best lines along which to work.

(1) *Concerted action of all maize growers in the particular locality is essential.*—This point is of great importance. It must be realized that whatever action is taken by one farmer may, to a certain extent, be nullified by neglect on the part of his neighbour.

(2) *Plant as usual, but distribute early-planted blocks of maize well over the farm.*—The result will be that these early blocks will carry the greater percentage of the early infestation of stalk-borer. If necessary, some or all of these blocks may be considered as potential spring trap-blocks, when one of the following early summer control measures can be applied:—

(*a*) The top-dressing of the plants with derrisol.

(*b*) The cutting out of infested plants.

These two methods should be applied at the correct time, according to observations made in the lands; otherwise the larvae will migrate from infested to uninfested plants.

(*c*) If the plants are very heavily infested, cutting them off with a mower and using this material as hay or to make silage is recommended. The cut plants should be removed at once to prevent the caterpillars from migrating from them to healthy plants. If possible, replough such blocks and plant again.

(3) *Where infestation is heavy, some or all of the late-planted blocks can be considered as potential, autumn trap-blocks.*—It will be realized that if proper attention is given to the early-planted blocks, the infestation in the later-planted ones should be comparatively light. If, however, some of these blocks become very heavily infested,

it is advisable to destroy them by mowing and to use the material for hay or silage. In cases of light or medium infestation, the blocks can merely be marked as danger spots for special winter treatment. This special winter treatment may consist of thorough grazing, stump grubbing followed by thorough winter ploughing and discing,

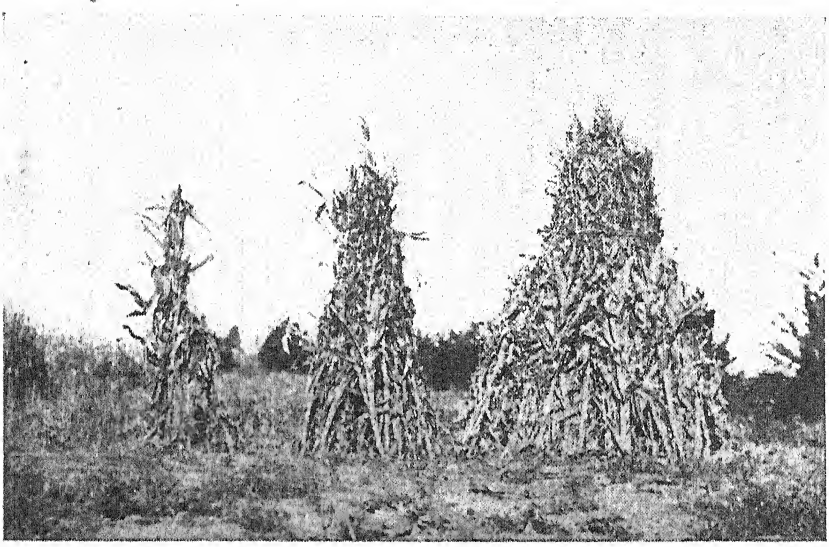


FIG. 2.—Ripening Early-cut Maize Plants in the Stooks.

or harrowing before ploughing. In cases of bad stubble infestation, grubbing by means of a triangular rail followed by raking together and burning should be undertaken.

(4) *Where conditions of maize growing are sufficiently intensive, a system of early cutting and ripening in the stook can be practised.*—This system is effective in preventing caterpillars from obtaining safe winter quarters in the maize stubbles. It appears to be of special interest in cases where late-planting has to be resorted to on account of late rains. This method has much to commend it, in that it gives us a means whereby very full use can be made of the maize plant as a whole. Now that the rearing of better stock is receiving attention, this should be a welcome method of providing good stock-feed.

Grazing down the whole maize plant also offers possibilities that warrant consideration by growers and stock farmers. In fact, the more the animal factor is brought in, the less serious will the maize stalk-borer problem become. The use of the whole plant for silage should also be considered.

Early Ploughing Operations.

(5) *Thorough winter or early spring ploughing assists materially in reducing the number of maize stalk-borer caterpillars that survive the winter.* An attempt should be made to finish ploughing before the emergence of moths takes place in spring. Special care should be exercised to ensure that all stalks are well covered with soil. It is advisable to have labourers following the ploughs with shovels to cover the stalks thoroughly. In cases where winter ploughing is not possible, stump grubbing is of great assistance, and when the rail stump-grubber is not available, a single and tandem disc harrow can

be used with advantage, especially as a preliminary to good ploughing.

(6) It appears that the seasonal occurrence of the insect varies according to the climatic conditions prevailing in each area and also during different seasons, and that *there is some advantage in delaying planting for some time when rains fall early.* The object of this is to miss a portion of the infestation, and to concentrate over a shorter period the infestation which does occur. This will facilitate summer-control measures, such as top-dressing with derrisol and cutting out, and may make it unnecessary to carry out these treatments more than once during the summer.

In addition, this delay facilitates cultivating the seed-bed, and thus controls the first weeds before planting. It must, however, be understood that delayed planting is only applicable when the spring rains fall early and there is consequently time for this procedure. In cases where the ploughing rains fall late, a portion of the infestation is, in any case, missed, and the effect is then the same as in the case of delayed planting.

The Use of Insecticides.

(7) *Under intensive systems of farming, top-dressing with derrisol and the cutting out of infested plants are very effective methods of control.*—In this connection it must be pointed out that treatment should not be delayed, since the infestation spreads from attacked to healthy plants.

Ineffective Methods.

It has been found that attracting moths to different coloured lights and different intensities of light is not effective; nor can attracting to various odours be advocated as a control measure. Trap-cropping by means of narrow strips helps very little in the way of controlling the pest. Although the strips carry a much higher population of borers than the main blocks, they do not serve to concentrate them sufficiently, as they are too small in comparison to the size of the main blocks of maize. The block system of trap-cropping offers much better prospects of effective control.

Borer-resistant Varieties.

With regard to resistant strains or varieties of maize, it appears that little hope can be held out in this direction. Some varieties are slightly less attacked when grown next to more susceptible ones, but they are not immune to any great extent, and when grown alone, will become infested to the same extent as the apparently more attractive varieties. Varietal resistance is only apparent on account of the different rates of growth amongst the different varieties.

Although there are various parasites and predators that cause stalk-borer mortality in varying degrees, depending on the seasons and localities, they are of no great economic importance, and it would also appear that little can be done to encourage them to increase in numbers under present circumstances.

Hard-skin in Peas.

T. G. la G. Joubert, Department of Genetics, Stellenbosch-Elsenburg College of Agriculture.

CANNED FRUIT is of the utmost importance, especially when seen against the background of present war conditions. Canning factories are making rapid progress in South Africa and canned vegetables have been receiving increasing attention during the past few years.

Among the vegetables used for canning purposes, peas occupy an important position. The varieties given preference are, Greenfeast, Emperor and Perfection. Large quantities of dried peas are also used for canning, especially after the season for green peas has passed. The ordinary field pea is widely used for this purpose. In this case the dried peas are soaked in water for 12 to 16 hours until they are fully swollen and approximate in size to the ordinary canned green peas. It may be added here that the present shortage of containers may restrict the canning of green peas in future.

Undesirability of Hard-skin.

The quality of canned peas is determined mainly by taste and tenderness of the product. Tenderness, especially, is very important and the demand for this quality often embarrasses the canners, since a small percentage of the peas fail to swell when soaked in water. This characteristic, which is known as hard-skin, varies in different samples from nil to more than 20 per cent.

In the factory, all hard-skin seeds must be removed by hand. This results in a considerable increase in the cost of labour. It is, therefore, in the interest of both the manufacturer and the producer that an attempt should be made to eliminate this undesirable characteristic.

Hard-skin is not confined to peas, but is very common amongst all legumes. It was even known to the ancient Greeks, and their opinion was that such seeds were closer to the wild state, i.e., they had not been sufficiently domesticated by continuous cultivation. In certain legume plants, the occurrence of hard-skin may be as high as 90 per cent. or more in clover varieties, 75 percent. in lupins and 25 per cent. in lucerne seed. Such affected seed may lie in the soil for a year or more, germinating only when the skins have reached a sufficiently advanced stage of decomposition. In some cases this characteristic may be an advantage, since continued propagation is secured in this manner. In other cases again it may be a nuisance, since the seeds may start germinating when other crops are already being cultivated on that soil, and in that way infest the lands like the well-known wild pea, which are really vetches. In such circumstances these legumes must be regarded as weeds.

Hard-skin in peas must not be confused with hardness or toughness in cooked peas. Hard-skin peas absorb no water while being soaked—they remain just as hard as the original dried peas. In the case of ordinary toughness, however, the peas do swell when soaked but remain tough after having been cooked and are somewhat unpalatable and of very poor quality. Many farmers will contend that tough peas are produced by certain types of soil. It seems, therefore, that the soil may have an effect on the quality of peas.

Various research workers have already investigated the chemical changes in the pea which are responsible for the softness of the canned product. It is found that a high calcium content (lime) is associated

with a tough pea while potash fertilizers tend to produce a more tender pea. An application of calcium chloride resulted in production of tougher seeds. It was furthermore found that the calcium content of the skin increases as the pea ripens and that this may probably be associated with such organic combinations as hemicellulose, lignine and pectase. These organic combinations have a direct effect on the quality of peas. Consequently calcium may be indirectly responsible for the quality of peas. This side of the question will be further investigated by chemists. It seems, however, as if the experience of farmers is correct, viz., that certain types of soil are more suitable for the production of a good quality dried pea than others.

Results of Experiments.

In these experiments, attention was paid only to hard-skin and the extent to which it is hereditary. At the beginning of 1940 the Department of Genetics of this Institution received a number of samples of dried peas from one of the canning factories. Approximately 6 to 8 per cent. of this seed possessed the characteristic of hard-skin. In order to determine the presence of hard-skin the seed was soaked in water for approximately 24 hours. All seeds which, after this soaking, were still as hard as the original dried seeds, were classified as hard-skin and these were further subdivided as smooth and wrinkled according to their appearance. All these seeds were planted and harvested separately. No hard-skin seeds were found among those produced on the test soils. Neither was there any difference noticeable between the seeds produced by wrinkled and smooth hard-skin seeds. A number of seeds which did swell when soaked in water were taken from the same sample and planted on a separate piece of soil which had received many previous applications of lime. These seeds were harvested at a later date and were found to contain about 8 per cent. of hard-skin seed. On different soils, therefore, soft seed produced 0 per cent. and 8 per cent. hard-skin seed respectively.

This matter was further investigated during 1941. An interesting point which cropped up was that peas of the original sample received in 1940 were again tested for hard-skin during planting time in 1941. Only 0·12 per cent. hard-skin occurred as against 6·8 per cent. during 1940. It, therefore, seems as if hard-skin decreases when seed is allowed to stand over for a long time. This matter is receiving further investigation.

The following groups of seed were planted:—

(1) Soft peas from soft parent plants.
(2) Soft peas from hard-skin parent plants.
(3) Hard-skin peas from hard-skin parent plants.

In addition a variety of approximately twenty imported and locally cultivated pea varieties were planted. In the case of some varieties hard-skin was absent, but most of the varieties contained about 3 per cent. of hard-skin seeds.

All the varieties were examined for hard-skin at the end of 1941. The following results were obtained:—

(I) Group I, viz., soft peas from soft parent plants, contained approximately 1 to 3 per cent. hard-skin seeds.

(II) Group II, viz., soft peas from hard-skin parent plants contained 1 to 3 per cent. hard-skin seeds.

(III) Group III, viz., hard-skin peas from hard-skin parent plants contained 0 to 2 per cent. hard-skin seeds.

 [Continued on page 791.

Less Well-known Legumes.

J. E. Pons, Extension Officer, Ixopo, Natal.

SINCE legume crops proved so profitable in the eastern Transvaal and climatic conditions correspond fairly well with those parts of southern Natal small quantities of certain legume seeds were distributed among various farmers in the latter area in order to ascertain how well they would do there. The following observations can now be made.

FIG. 1.—Velvet beans and Dahl.

Velvet and Dolichos Beans.

Somerset velvet beans and dolichos beans (Lab-lab) were the kinds tested out. Both types were found to grow very well in the warm protected parts of Natal, i.e. in the neighbourhood of Ixopo and at lower altitudes (less than 3,500 feet). They are also suitable for silage purposes. Neither crop showed any signs of disease and both retained their leaves until late autumn.

In parts where there was little or no frost, especially near the coast, the dolichos beans remained green, flowered and bore pods. In one particular case in the eastern part of Richmond, a crop which had not been reaped or ploughed lost its leaves in August and in September, but now the plants are sprouting again.

In most cases where dolichos beans remained green in winter the velvet beans lost their leaves and dried out, especially when the weather was somewhat cold.

Dolichos beans will therefore serve excellently as winter fodder in areas which are free from frost, as along the coast. In these parts sugar cane is used fairly extensively for the purpose. The protein

content of sugar cane is low, however, so that dolichos would therefore make an excellent mixture with this crop. Where dolichos beans were fed to dairy cows in the form of hay or green feed, the milk-production showed a very rapid increase.

Yields.

According to figures obtained from the Nelspruit Sub-tropical Research Station, the hay yield of velvet beans was higher there than that of dolichos beans, as appears from the following table.

Crop.	Hay yield per morgen (ton)				Seed (lb.) per morgen.		
	1937/ 1938.	1938/ 1939.	1939/ 1940.	Aver-age.	1937/ 1938.	1938/ 1939.	1939/ 1940.
Sunn hemp.........	6·1	8·4	8·5	7·6	3,400	3,600	3,636
Velvet beans.........	8·4	6·2	5·0	6·6	1,741	1,686	1,392
Dolichos beans.......	5·3	5·6	3·2	4·6	1,201	1,164	1,386

In southern Natal, however, dolichos beans appear to give higher yields than velvet beans, judging by the growth last summer and in cases where the crops were planted next to each other. At a farmers' day held on the farm of Mr. Guy Eaglestone, near Creighton, the farmers without exception preferred dolichos beans to velvet beans. When the beans were harvested, three large wagon loads (6 tons) of green feed per ½ acre were obtained from the dolichos beans, whereas the velvet beans (adjacent plot) only 1½ wagon loads (3 tons) of green feed per ½ acre. It must be stated, however, that the velvet beans were planted somewhat farther apart than the dolichos beans. Dolichos beans apparently do better on rich soil, and this may account for the difference in yields at Nelspruit and Creighton, unless this can be ascribed to the unusual nature of the season.

Dolichos Beans.

Dolichos beans are excellent for hay-making purposes, especially since the plant retains its leaves very well. Like velvet beans and the prostrate varieties of cowpeas, this plant also has the disadvantage of having to be cut by hand, but once this has been done, subsequent handling is simple and inexpensive. A method which may be followed is to allow labourers to walk between the 2nd and 3rd, 4th and 5th, 6th and 7th rows etc., and to pull the vines apart. Other labourers follow, cut the exposed stems just above the ground and gather the vines into rolls approximately 3 to 4 feet long and 12 to 18 inches high. Thereafter, handling is easy and very few leaves are lost. The rolls are turned several times to ensure thorough drying. The handy form of the roll greatly facilitates loading and unloading.

Dolichos-bean hay has a fine green colour, and even if a little rain falls during the haymaking period, this does not seriously affect the colour or quality of the product.

Dolichos beans have this disadvantage, however, that they do not easily set seed, especially in high-lying areas, and that in some seasons insects destroy the seeds in the pods. This difficulty was not experienced along the coast, which may be due to the fact that the beans flowered and bore pods in winter when the insects were much less active.

Unfortunately no dolichos-bean seed is obtainable this year, so that for this season at any rate farmers who had intended growing them are advised to plant velvet beans instead.

Velvet Beans.

Provided they are planted early enough, velvet beans readily set seed. The pods, which are very hard, are not subject to insect damage. In warm, low-lying parts velvet beans can, therefore, be cultivated successfully for seed.

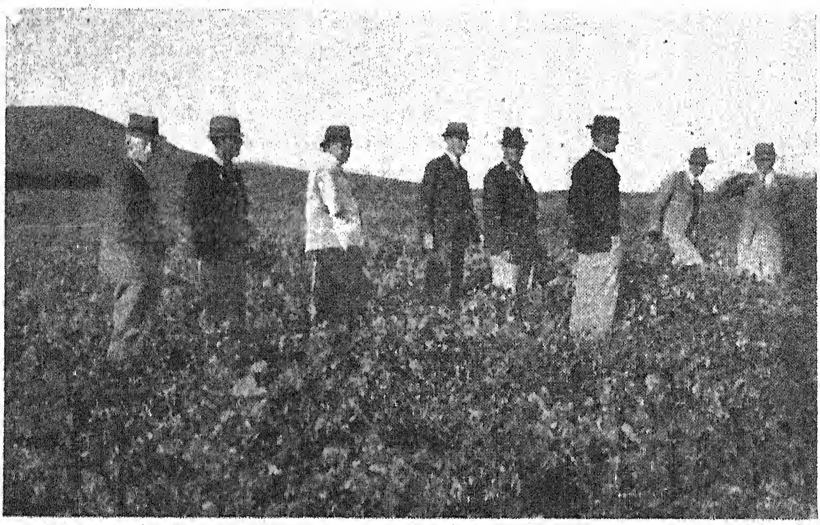


FIG. 2.—Dense stand of Dolichos beans.

It is necessary to warn farmers against feeding pigs excessive quantities of velvet beans, which may be detrimental to them. For this reason, velvet beans should not constitute more than one-half the protein portion of the ration. For ruminants, velvet beans are quite safe. The pods are very hard, but if they are spread out in the sun in a thin layer for a few days they burst open partially and shatter their seed.

The pods may also be ground whole in a hammermill, the product being an excellent supplementary feed for dairy cows. Farmers in suitable areas are advised to cultivate this crop as a substitute for cowpea and other cake meal, when the latter are difficult to obtain.

Silage made from Velvet and Dolichos Beans.

Dolichos and velvet beans may be converted into excellent hay and silage. The fact that they retain their leaves so long is a great advantage, which enables the farmer to cut in favourable weather. Crops like cowpeas and soybeans shed their leaves at a certain stage and must be cut before that time if intended for hay or silage. Velvet and dolichos beans may be cut even as late as May.

A farmer near Umzimkulu has been cultivating dolichos beans and wintersome for silage for several years. Wintersome gives very high yields (15 to 25 tons per acre in the Umzimkulu area) and retains its succulence until late in winter. This farmer ensiles maize, cowpeas and soybeans (March-April) and after that wintersome and

dolichos beans until April-May. An average yield of 8 to 9 tons of green feed per acre is obtained from dolichos beans.

Velvet beans may be planted together with maize in the same row. If two maize seeds are planted to each velvet bean the beans will climb up the maize plants. Such mixed planting has an advantage over soybeans and maize planted in the same row, since soybeans often lose their leaves before the maize is ready to be cut. In addition, such soybeans often form slender, upright plants.

For planting soybeans in this way, 15 to 20 lb. seed per acre is required. Instead of being ensiled, the maize and bean plants may be allowed to ripen for seed purposes if necessary. The maize and bean plants may then be grazed off in winter, after the seed has been harvested.

Sunn Hemp.

This crop flourishes in warm areas, sometimes reaching a height of 5 to 9 feet. It has also done well even in higher areas, although it did not reach the same height. In such cases no signs of disease were observed.

In Ixopo, Sunn hemp has also been fed to cattle in the form of silage and hay, which was eagerly consumed. Animals, however, do not very readily eat the green plants. Many farmers are deterred from using Sunn hemp as a fodder because it is also cultivated for fibre production. Nevertheless, if cut at the right stage (flowering stage) it is very nutritious. It grows erect and can be cut with a mower.

Sunn hemp seed is somewhat poisonous and should not be fed to cattle. If, however, the crop is out in the flowering stage for haymaking and silage purposes, there is little danger of much seed being present in the product.

Sunn hemp differs from the above-mentioned bean crops in that it loses its leaves after a certain period. It also tends to become woody after a certain stage has been reached. These various factors necessitate cutting at an early stage.

From the yield obtained at Nelspruit it appears that Sunn hemp gives higher hay yields than either velvet or dolichos beans, and it has the further advantage of being resistant to eelworm (root gallworm). When included in a system of crop rotation, it will therefore, be of great value in reducing eelworm infestation.

Sunn hemp fits in very well in a system of crop rotation with winter crops, since it requires a growing period of only 2½ to 3 months when intended for haymaking, silage or green-manuring purposes.

The following system of crop rotation is suggested:—

(*a*) Sunn hemp (ploughed under), winter crop for fodder (kale or oats), maize, winter fallowing.

(*b*) Maize, maize, legume for hay or silage, Rhodes grass.

(*c*) Maize, maize, sunn hemp ploughed under for soil fertility.

Sunn hemp is still relatively unknown but deserves much more attention.

Hints on Cultivation.

Since Sunn hemp, dolichos beans and velvet beans require a growing period of 6 to 7 months to produce seed, they must be planted as early as possible (preferably September-October), in areas which are subject to frost. In areas which are free from frost, they may be planted later to ripen their seed in winter. In that case the seed

is harvested from June-August. Frost-free areas are undoubtedly the best for seed production, especially in the case of dolichos beans.

Velvet and dolichos beans may both be planted later in the season e.g. in December when intended for ensiling or hay-making purposes. When dolichos beans are cultivated for winter fodder in

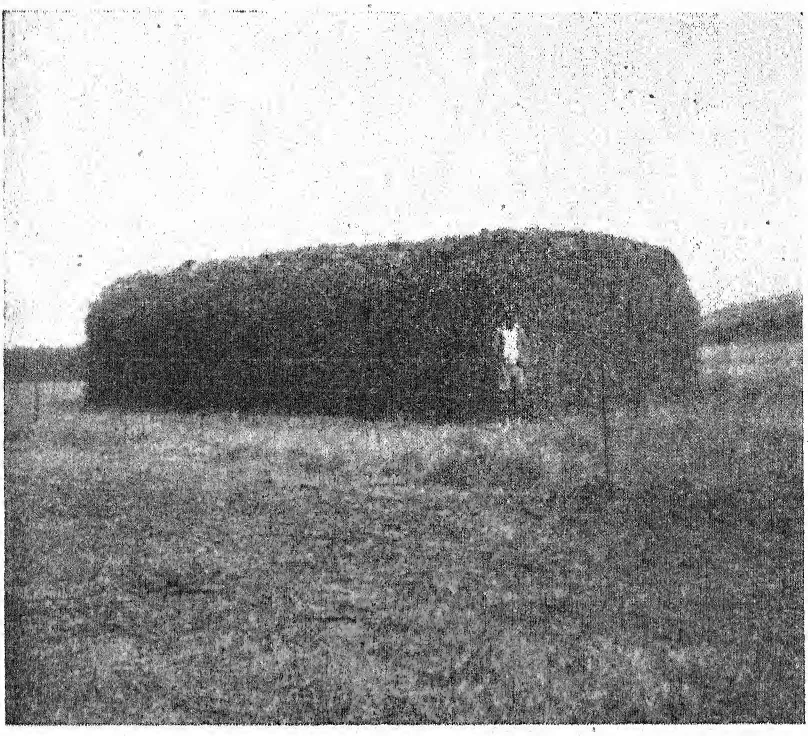


FIG. 3.—Stack of upright cowpea hay.

frost-free areas, they must be planted in January, otherwise they will be too far advanced when winter sets in.

Sunn-hemp should be planted in January when cultivated for hay or silage. This will more or less ensure that it will be ready to be cut for hay after the rainiest part of the season is over. Where it is cultivated for ensiling with maize, both crops will be ready for cutting at approximately the same time. If Sunn hemp is intended for silage to which molasses will be added, it may be planted as early as September or October. In that case it will be ready for cutting in January and the lands may then still be used for a winter crop. All three crops are well able to resist drought, germinate readily, and respond well to an application of a phosphatic fertilizer of 200 to 400 lb. per morgen. Development of Bacterial nodules on the roots is usually very satisfactory.

Soybeans and erect cowpeas also yield good results in the neighbourhood of Ixopo and Richmond. The erect type of cowpea is more rust resistant than the ordinary prostrate variety.

Nutritive Value of Legumes.

There is little difference in the food values of the various legumes, especially as regards the protein content of the hay.

Farmers will, therefore, be able to substitute one legume hay for another in feeding dairy cows, without any fear that production will be seriously affected. As a rule, farmers in Natal ensure that their cattle, especially dairy cows, receive sufficient proteins in their rations. In many cases, however, these proteins are bought in the form of ground cake, bran, feed mixtures, lucerne, etc. Farmers should rely more on their own production of legumes, especially at times like the present when some of the feeds mentioned are difficult to obtain and very expensive.

The planting of legumes in a system of crop rotation, and the application of effective measures for combating soil erosion, will do much towards counteracting erosion and maintaining soil fertility.

Bloating in Ruminants.—

[*Continued from page 760.*

of fermenting is retarded to such a degree that the danger of bloating disappears. For this purpose the regular inclusion of good grass or lucerne hay, concentrates, silage or molasses in the ration is completely effective. Where animals depend exclusively on green lucerne grazing, particular care must be taken not to remove them from the grazing too frequently, since it is precisely then that they are inclined to eat greedily and consequently to develop bloating. In fact, if they are left to graze peacefully on the lucerne, they generally soon learn to avoid the danger of hoven by repeatedly interrupting their grazing and eating only small quantities of lucerne at a time. In cases where, under such conditions, individual animals continue to show signs of bloating, it is desirable to change their feed.

Apart from the danger of bloating, green lucerne has a further disadvantage which effects its nutritive value, viz., that its high water content together with the large quantities of gas and foam which it produces in the fore-stomach, is apt to fill the rumen, giving rise to an illusory satisfaction of the appetite. This means that the animal actually ingests a much smaller quantity of solid feed constituents, with the result that lucerne alone is not sufficient to satisfy the daily requirements of producing animals such as dairy-cows, lambing ewes, and growing lambs, which in such circumstances require solid supplementary feed in the form of hay or maize. This aspect of the matter is of particular importance in the dairy industry, as well as in the production of fat lambs.

The findings of these experiments further indicate that the nutritive value of a given nutrient is not determined by its chemical composition only, but that the nature of the bacterial infection present on the feed, the conditions created by the feed in the fore-stomachs and finally, the composition of the bacterial flora in this part of the digestive system, are all factors of the greatest importance in the feeding of ruminants. Just as certain organisms are responsible for the normal processes of digestion in the fore-stomach, other bacteria may also, if given the opportunity, cause various disturbances common to ruminants. This subject forms a wide and important field for further research.

The Storage Disorders in Some Apple Varieties.*

Dr. W. Edwyn Isaac, Government Low Temperature Research Laboratory, Cape Town.

AT this Laboratory storage tests were carried out on nine apple varieties, viz., on Golden Delicious, Granny Smith, Ohenimuri, Red Delicious, Rome Beauty, Wemmershoek, White Winter Pearmain, York Imperial and Winter Red.

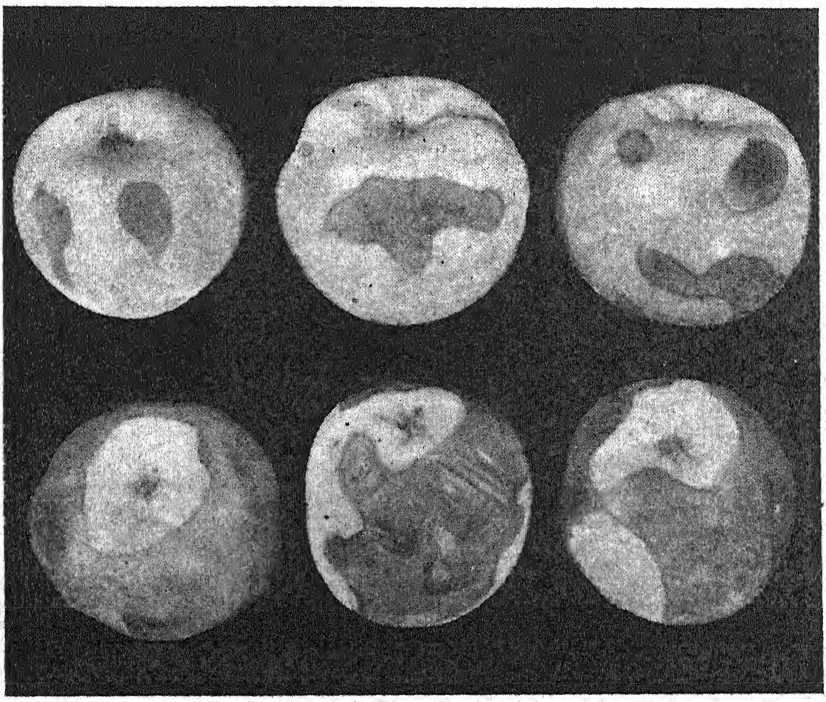


FIG. 1.—Soft scald on Rome Beauty apples stored at 31°F.

These tests have been conducted for four years, some varieties having been stored in each of the four seasons, while others were stored over shorter periods. Commercial export consignments were used throughout.

The statements made are liable to modification as the available information increases. The following general considerations should be borne in mind:—

(1) Not every consignment of a fruit variety will necessarily develop a storage disorder to which the variety is prone. Apples from certain districts may develop the disorder, while apples from other districts show it to a slight extent or not at all. There are also seasonal differences.

(2) A disorder may or may not be evident immediately on withdrawal from store. In the latter case it may become evident later at a higher temperature.

* A report on "The Incidence of Superficial Scalds in Appels grown in South Africa in relation to Storage Temperature" is obtainable from the author.

The remarks which follow, apply to apples which have been kept for a week at 65° F. or 68° F. following removal from store.

The disorders of stored apples fall into two groups—fungal infection and physiological injuries. The first group is due to fungal attack causing rotting of the apple. The second type of disorder results from some upset of the normal balance of physiological processes. We are here only concerned with the physiological injuries. Under ordinary cold storage conditions the wastage of apples due to fungal infection was, with few exceptions, not great in the storage tests carried out at this Laboratory.

Soft Scald.

Externally this injury is characterised by brown patches of irregular shape which are sharply delimited from the surrounding unaffected skin (Fig. 1). The flesh immediately underneath becomes brown and soggy to a depth of up to a centimeter, but usually the flesh is affected to a decidedly lesser depth. At a more advanced stage the affected areas tend to *collapse* and secondary fungal infection is common. Soft scald most frequently develops in the "equatorial" parts of the apple. According to Plagge and Maney soft scald is a form of soggy breakdown (Plagge and Maney, 1937).

Soft scald is a disorder which develops at low storage temperatures and can be controlled by storing susceptible apple varieties at temperatures of not lower than 35° F. to 36° F.

Rome Beauty is liable to develop the disorder when stored at 29° F. and 32° F. and a very small percentage of apples may develop the disorder at 35° F. At this Laboratory, soft scald has, with few exceptions, only been found to occur to any significant extent in Rome Beauty when stored at 29° F. at which temperature a maximum of 18 per cent. was affected.

Ohenimuri apples showing the disorder have been sent to the Laboratory, but it has not been observed in the consignments of that variety stored at this Laboratory.

Breakdown.

With the exception of Winter Red apples, breakdown is not a major disorder in the varieties dealt with here. It was found to arise in at least four different ways:—

(i) From severe bruises (Red Delicious, Rome Beauty, Winter Red).
(ii) Following on water core (hart water).
(iii) Storage at too low a temperature (Rome Beauty at 29° F.).
(iv) Senescence.

The first source of breakdown can be eliminated by careful handling on the farm and in transit. Apples showing water core, unless the disorder is only slightly developed, can be recognised by their external appearance, and sorted out.

The Winter Red consignments examined have shown very considerable amounts of breakdown. It would seem that although susceptibility to this disorder increases with increasing storage temperature, the breakdown mostly, if not entirely, results from bad bruises, water core and senescence. Further work is, however, needed on breakdown of Winter Red apples.

Breakdown chiefly affects the flesh, which becomes brown and spongy. The vascular tissue is usually of a darker brown colour (Fig. 2). When breakdown is extensive, the skin also becomes

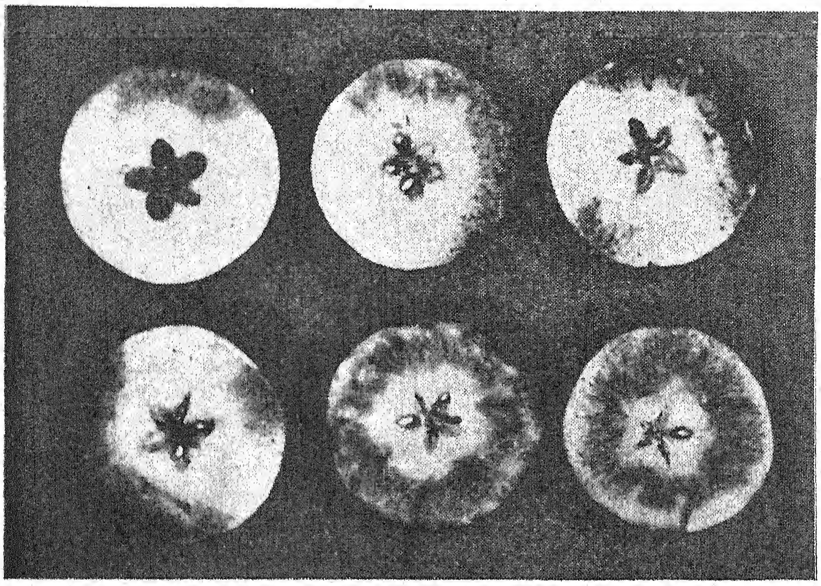


FIG. 2.—Winter Red apples cut across to show severe breakdown.

discoloured. Even when the skin is not affected, however, breakdown can be detected by the springy feel of the apple.

Bitter Pit or Storage Pit.

Small nests of dead brown tissue develop in the outer flesh just below the skin. In most cases the overlying skin also becomes dark in colour and slightly sunken. This is not, however, necessarily the case, and the presence of dead tissue may be indicated from the outside only by the presence of greyish coloured areas. The diameter of the affected areas varies from about 1 to 5 millimeters (Fig 3.).

Pitting sometimes develops while apples are still on the tree, but mostly pitting develops in store. Both types of disorder are usually termed bitter pit, though reference is generally made to the storage disorder. Carne and his co-workers suggest the term "Storage Pit" for the pitting developed in store, and "Tree Pit" for the pitting of the apples while still on the tree.

Fig. 3.—Red Delicious apples showing severe storage pit.

All the varieties are in greater or lesser degree liable to storage pit. Of the varieties considered here, Red Delicious showed the severest storage pit.

When the amount of storage pit was small its occurrence in relation to the temperature and length of storage was erratic. When a greater number of apples were affected, pitting tended ~~on the~~ whole

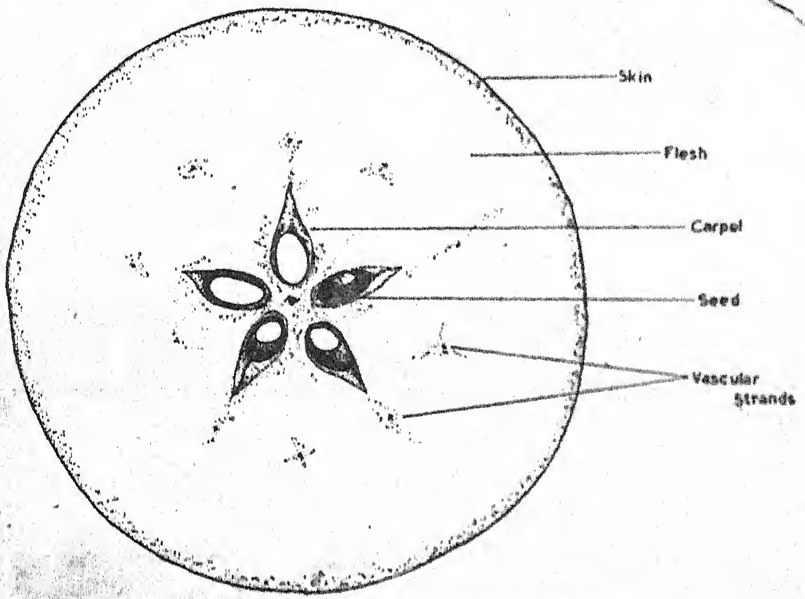


Fig. 4.—Diagram of an apple in cross-section.

to be more prevalent in apples stored at higher than at lower temperatures. Considerable irregularities were, however, encountered. This relationship was more marked immediately on withdrawal from store than after the apples had been kept for a few days at a higher temperature. This relationship was also more marked during the earlier months of storage. These considerations indicate that while storage temperature may have some effect on the number of pitted apples, lower storage temperatures for the most part serve only to delay the development of an inherent disorder.

It may be noted that in regard to pitting, Reyneke and Eksteen (1934) considered that South African apples are generally picked too early: "... by delaying the commercial picking for 14 to 20 days, big losses suffered as a result of bitter pit may be avoided".

Core Flush.

Core flush is a browning of the apple tissue at the core, i.e., of the tissue between seed-containing cavities (carpels) and within the level of the ten vascular bundles (Figs. 4 and 5). This has been observed in Granny Smith, Ohenimuri and Red Delicious apples. It develops at higher rather than at lower storage temperatures, but was completely absent at 29° F. and 32° F. in Ohenimuri during a six months storage period. This variety stored at higher temperatures was particularly liable to the disorder both in regard to the intensity of the disorder on individual apples as well as the number of apples affected. Its relation to storage temperature was some-

what more erratic in Granny Smith, but it is a less severe disorder in this variety than in Ohenimuri.

Superficial Scald.

As the name implies, this disorder affects the skin of the apple. The flesh is sometimes affected to a depth of a few millimeters in very severe superficial scald of Rome Beauty apples.

Superficial scald varies considerably in appearance. It may develop as more or less circular areas (centering around lenticels) of from less than a millimeter to five or more millimeters in diameter. Diameters of intermediate size are most usual. (Rome Beauty, Pearmain). Again the scald may be diffuse or in irregular patches. Continuously scalded areas may (Granny Smith) or may not (Ohenimuri, Winter Red) be slightly depressed. The colour of the affected areas also varies from dirty gray and dirty green through light and medium brown to dark brown. The appearance of the scald depends partly on the length of the storage period and partly on the variety. Granny Smith develops two kinds of superficial scald, one at lower and another at higher storage temperatures. One apple may show more than one kind of superficial scald as is frequently the case with Rome Beauty.

Superficial scald of one kind or another is a widespread storage disorder of South African apples. It may not be very apparent immediately on withdrawal from store and is always much more apparent after the apples have been kept for a few days at a higher temperature (65 to 68° F.).

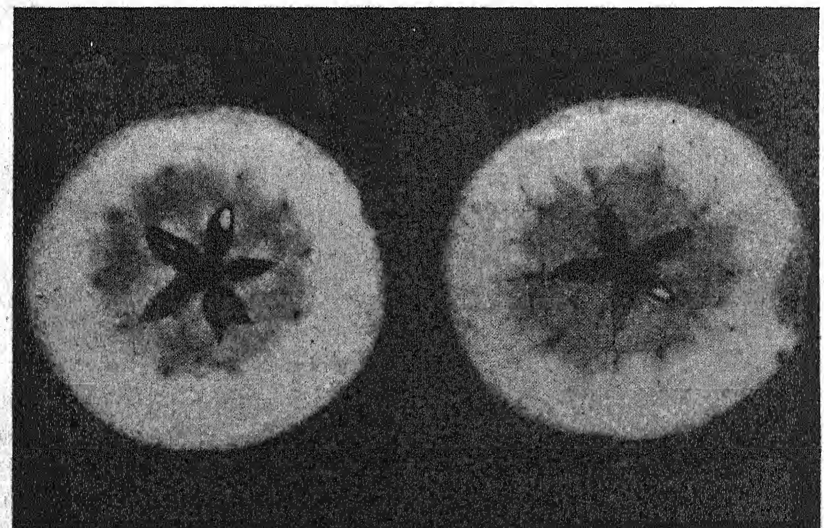


Fig. 5.—Severe core-flush in Ohenimuri apples.

Superficial scald in the apples under consideration occurs chiefly at two temperature ranges, viz., (1) 29° F. to 33° F. and (2) 37° F. to 45° F.

The apples which fall into one or other of these groups are:—*Type* 1 (29° F. to 33° F.), Granny Smith, Red Delicious, and Wemmershoek; *Type* 2 (37° F. to 45° F.), Granny Smith, Winter Red, Ohenimuri, and Pearmain.

The superficial scald of Granny Smith apples which develops at higher storage temperatures is less severe and develops later in storage life than that which develops at lower storage temperatures.

Apples subject to the second type of superficial scald should be stored at temperatures lower than 35° F. This is most emphatically the case with Ohenimuri, which stores well at 32° F. but which may develop considerable superficial scald at 35° F. as well as at higher temperatures. Apples subject to the first type of superficial scald should not be stored at temperatures lower than 35° F. Granny Smith should be stored at a temperature of 35° F. to 37° F. but it is best not to store at a higher temperature than 37° F. This is also true of the other varieties, since at higher temperatures the apples are more prone to fungal infection, have a shorter storage life and may develop a dull, dead colour as is the case with Wemmershoek.

By wrapping apples in oiled paper, superficial scald is controlled with different degrees of efficiency, depending on the variety and on the storage temperature. Oiled wrappers are especially effective at temperatures other than the optimum for the development of the scald concerned. They were most effective with Red Delicious, Wemmershoek, and Pearmain, and least effective with Ohenimuri. Even when the number of apples affected was not reduced, the intensity of the disorder on the individual apples were lessened. Thus the use of oiled wrappers can be recommended for the varieties which develop superficial scald.

The consignments of Golden Delicious and York Imperial stored at this Laboratory did not develop superficial scald.

So far no mention has been made of Rome Beauty. This is a difficult variety to deal with, since the incidence of superficial scald in relation to storage temperature varies from season to season and from district to district. Also a considerable amount of superficial scald is liable to occur at all storage temperatures. In general, however, it is more severe at the higher rather than at the lower storage temperatures. Also except at the temperature most favourable for its development, the disorder is entirely eliminated or substantially controlled by the use of oiled wrappers.

Conclusions.

Fungal wastage is reduced by storing the apples at the lowest temperature compatible with the minimum development of functional disorders of the major functional disorders, bitter pit or storage pit is chiefly conditioned by pre-storage factors. The superficial scalds can in most cases be eliminated or reduced by storage at suitable temperatures and *the use of oiled wrappers.* These considerations indicate that of the apple varieties dealth with, all, except Rome Beauty, fall into one or other of the two optimum storage-temperature groups which are based essentially on the temperature levels at which superficial scald develops. In the absence of superficial scald the apples are best stored at the lower storage temperature. *Golden Delicious, Ohenimuri, White Winter Pearmain, York Imperial and Winter Red should be stored at about 32° F. Granny Smith, Red Delicious and Wemmershoek should be stored at about 35° F. to 36° F.* Except for Golden Delicious and York Imperial, oiled wrappers should be used. It is unsafe to make any definite statement for Rome Beauty on the basis of available data. It would be safest, perhaps, to store this variety above 30° F. and below 35° F. and to wrap the apples in oiled papers.

[*Continued on page 806.*

Poultry Rations without Wheaten Bran and Pollard.

P. J. Serfontein, Professional Officer (Poultry), College of Agriculture, Potchefstroom.

THE inclusion of wheaten bran and pollard in poultry rations has been a practice recommended even in the earliest literature on poultry-feeding. Since these constituents used to be obtainable practically everywhere in large quantities at reasonable prices, and because they also contain valuable nutrients, they have come to be regarded through the centuries as a traditional and indispensable constituent of our present poultry rations. As a result of the promulgation, recently of the regulations with regard to the milling of wheat, however, a large proportion of the two by-products mentioned is no longer available for poultry feeding.

The importance of wheaten bran and pollard in poultry feeding can be attributed mainly to the fact that wheaten bran has a high protein-content and a high biological value. The essential amino acids arginine, lysine, tryptaphane, tyrosine and cystine, are of the utmost importance, and are at times the limiting factors where rations are made up of certain cereal products. The wheat germ is rich in the anti-neurotic vitamine BI, or thiamine—this portion usually being included in the pollard. Wheaten bran and pollard are rich in vitamine B2, or riboflavine, and vitamine E. In addition, wheaten by-products are rich in minerals, especially phosphorus and manganese.

The latter mineral, together with choline, prevents perosis, an abnormality of the legs which occurs particularly when rations consisting for the greater part of maize or maize products are fed. In addition, wheaten bran is important for the bulk it gives to the mash.

Experiments with Substitutes.

Substitute constituents should primarily contain those nutrients previously supplied by bran and pollard, and secondly should make these nutrients available in adequate quantities at reasonable prices. Consequently, tests were carried out at Potchefstroom with products complying with these requirements, viz., maize and maize by-products, oatmeal and lucerne meal. The new rations were built up around these three products.

The chicks were hatched in an electric Petersine incubator, reared in battery brooders during the first six weeks, and subsequently in a long brooder house. The chicks, as well as the feed consumed by them, were weighed weekly. Changes were effected in the feed supply, according to the number of chicks which died. Each chick was examined weekly for symptoms of nutritional deficiencies. At the age of 10 weeks the pullets and cockerels were weighed separately. The rations fed are given in table 1.

Green feed was supplied from the third day onwards. Manganese sulphate was added to all the rations at the rate of ½ lb. to every ton of feed. The bean meal was made from scrap beans obtained from wholesale merchants.

The average weights, feed consumption and mortality (percentage) up to the age of 10 *weeks, are given in table* 2.

A certain amount of toe-pecking and cannibalism was observed in the case of all ration-groups especially ration-groups No. 4. Nevertheless, from a practical point of view, this can be considered

normal. Ration No. 2 was also fed to the section chicks and yielded satisfactory results. On the whole, feather growth was good, ration No. 3 in particular, being found excellent in this respect, probably as a result of the groundnut meal it contained.

TABLE 1.—(*a*) *For Chicks.*

Constituents.	1.	2.	3.	4.	5.	6.	7.
Yellow Mealiemeal....	70	60	65	50	60	60	85*
Oatmeal............	10	15	—	10	15	15	—
Lucerne meal........	5	10	15	10	10	10	10
Wheaten bran........	15	—	—	—	—	—	—
Pollard............	20	—	—	—	—	—	—
Meat Meal (80% P.)...	18¾	15	15	15	13¾	13	5
Bean Meal..........	—	—	—	—	10	20	—
Groundnut meal......	—	—	5	—	—	—	—
Germ Meal..........	—	—	—	15	—	—	—
Bonemeal...........	2	2	2	2	5	4	2
Oystershell powder....	1	3	3	3	1½	2	3
Salt..............	½	½	½	½	½	1	1
Cod-liver oil.........	1%	1%	1%	1%	1%	1%	—
Proteins...........	19·94	19·94	21·6	21·7	19·85	19·7	12·7
Ca................	1·72	1·76	1·80	1·9	1·71	1·60	1·6
P.................	0·62	0·53	0·53	0·57	0·60	0·68	0·49
Fibre..............	3·82	4·82	4·90	5·4	4·80	4·90	3·4

* Lucerne leaf meal was used and skimmed milk was always available to be fed to the chicks. No drinking water was given.

TABLE 2.

Ration.	AUSTROLORPS.						WHITE LEGHORNS.					
	Cockerels.	Pullets.	Average.	Feed Consumption.	Original group.	Mortality percentage.	Cockerels	Pullets.	Average.	Feed consumption.	Original group.	Mortality percentage.
	lb.	lb.	lb.	lb.			lb.	lb.	lb.	lb.		
1..........	1·76	1·59	1·65	5·53	143	6·6	1·61	1·43	1·52	5·41	66	6·00
2..........	2·00	1·70	1·87	6·40	98	8·1	1·55	1·42	1·49	5·30	73	—
3..........	1·39	1·52	1·46	5·10	128	6·2	1·61	1·42	1·35	5·45	72	—
4..........	1·51	1·35	1·42	5·10	100	11·0	1·78	1·45	1·55	5·61	67	—
5..........	1·85	1·48	1·68	5·71	50	6·0	—	—	—	—	—	—
6..........	1·83	1·41	1·62	5·73	50	10·0	—	—	—	—	—	—
7..........	1·91	1·60	1·67	4·79	50	10·0	—	—	—	—	—	—

The following percentage of toe-pecking, cannibalism and perosis is given in table 3.

TABLE 3.

AUSTRALORPS.				LEGHORNS.			
Ration.	Toe pecking.	Cannibalism.	Perosis (slipped tendon).	Ration.	Toe-pecking.	Cannibalism.	Perosis.
	%	%	%		%	%	%
1..........	1·1	—	1·1	1..........	2·3	—	—
2..........	1·8	—	1·8	2..........	1·9	—	—
3..........	2·1	1·0	2·2	3..........	2·4	—	—
4..........	4·3	5·2	2·5	4..........	1·7	—	—
5..........	3·3	2·2	2·4	—	—	—	—
6..........	2·1	2·4	2·1	—	—	—	—
7..........	—	—	1·5	—	—	—	—

The rations referred to did not furnish the necessary anti-dermatitis vitamins for safeguarding the birds against dermatitis during the first three weeks of growth. Even ration No. 1, in which bran and pollard were used, were deficient in this respect. Although no white Leghorns developed any perosis (slipped tendon) in battery brooders, it was evident in a small percentage of Australorps, particularly when they were fed on ration No. 3, despite the fact that manganese sulphate was included at the rate of ½ lb. to every ton of the mixture fed.

According to the most recent available data, it is claimed that both choline and manganese are necessary in a ration to prevent perosis. Wheat and wheaten products contain reasonable quantities of manganese; maize and maize products, on the other hand, are very low in this mineral. The fact that perosis still occurred despite the addition of manganese sulphate may be due to the deficiency in choline.

Ration No. 7 gave very satisfactory results and can undoubtedly be fed with advantage where mixed farming is practised. Pullets raised on ration No. 7 came into production, on an average, 15 days earlier than pullets fed on ration No. 2 (Ration No. 2 plus tobacco and molasses) and weighed on an average, 0·76 lb. more at the age of six months.

(*b*) *For laying-hens.*—The following rations were fed to year-old black Australorp hens which were housed in laying-houses 18 feet by 24 feet. Each group consisted of 60 hens and six cockerels. The experiment was commenced on 8 March, 1941 and terminated on 8 March, 1942.

TABLE 4.

Constituents.	Ration.			
	1.	2.	3.	4.
	lb.	lb.	lb.	lb
Yellow Mealiemeal	40	60	55	50
Wheaten bran	40	—	—	—
Pollard	40	—	—	—
Oatmeal	20	10	—	15
Lucerne meal	10	15	20	15
Germ Meal	—	—	10	—
Meat Meal (80% P.)	30	15	15	20
Bonemeal	7	1	1	1
Powdered Oyster shell	12	4	4	3
Salt	1	1	1	1

The ration was composed as follows (with equal parts of crushed maize):—

Proteins	16·23	14·20	15·20	16·30
Calcium	1·66	0·90	0·90	1·30
Phosphorus	0·65	0·35	0·36	0·36
Fibre	3·88	3·70	4·30	4·05

The dry mixture and the powdered oyster shell were always available to the hens in open troughs. Green feed was fed once daily, in the morning, and a cereal in the afternoon. The hens were allowed to run in camps. The two-monthly average weights of the hens showed a gradual decrease from May to the following March. This loss in weight was most marked in groups 3 to 4.

TABLE 5.—*The average monthly feed Consumption and production per hen for the various groups were:—*

Month.	1.				2.				3.				4.			
	Eggs per Hen.	lb. Cereal.	lb. Mixture.	Total.	Eggs per Hen.	lb. Cereal.	lb. Mixture.	Total.	Eggs per Hen.	lb. Cereal.	lb. Mixture.	Total.	Eggs per Hen.	lb. Cereal.	lb. Mixture.	Total.
May...........	2·4	3·0	4·2	7·2	4·2	3·0	4·4	7·4	3·7	3·0	4·2	7·2	3·2	3·0	4·5	7·5
June...........	9·7	3·6	3·3	6·9	7·6	3·6	3·5	7·1	6·2	3·6	3·8	7·4	6·2	3·6	4·1	7·7
July...........	10·2	3·6	4·2	7·8	10·9	3·6	3·8	7·4	9·6	3·6	4·3	7·9	11·1	3·6	4·4	8·0
August.........	18·5	3·6	4·6	8·2	14·4	3·6	4·4	8·0	13·7	3·6	3·8	7·4	14·9	3·6	4·2	7·8
September......	15·6	3·1	4·7	7·8	13·6	3·1	4·1	7·2	11·3	3·1	3·1	6·2	12·9	3·1	4·0	7·1
October.........	15·7	3·0	4·0	7·0	11·3	3·4	3·9	7·3	8·08	3·2	4·0	7·2	9·8	3·2	4·0	7·2
November.......	13·0	3·1	4·4	7·5	10·0	3·3	3·1	6·4	9·7	3·4	3·2	6·6	9·2	3·5	4·2	7·7
December.......	14·5	3·3	4·6	7·9	13·7	3·1	3·9	7·0	7·6	3·2	2·9	6·1	9·8	2·4	3·6	6·0
January........	13·4	3·2	4·4	7·6	13·2	3·2	4·0	7·2	7·9	3·5	3·4	6·9	8·8	3·2	3·5	6·7
February........	12·3	3·4	3·4	6·8	13·9	3·4	4·0	7·4	10·0	3·4	3·9	7·3	10·0	3·3	3·6	6·9
TOTAL....	124·3	32·9	41·8	74·7	112·8	33·3	39·1	72·4	87·7	33·6	36·6	70·2	96·0	30·8	40·1	72·6

As can be seen from this table, all the hens recived more or less the same quantity of maize. Subsequently it became difficult to adjust the quantities accurately to the changed numbers arising as a result of deaths.

[*Continued on page 791.*

Regional Improvement.

J. Joubert, Extension Officer, Ladismith, C.P.

THE efficacy of the Department's soil-erosion scheme, in so far as regional improvement is concerned, is dealt with by the author in a series of articles, the first of which describing the districts of Ladismith, Prince Albert and Barrydale appeared in the January 1942 issue of "Farming in South Africa". The second article dealing with the question of water conservation in the districts of Paarl, Worcester, Robertson and Piquetberg was published in the August issue. The third article deals mainly with contour embankments and the diversion of flood water in the districts of Beaufort West, Victoria West and Britstown.

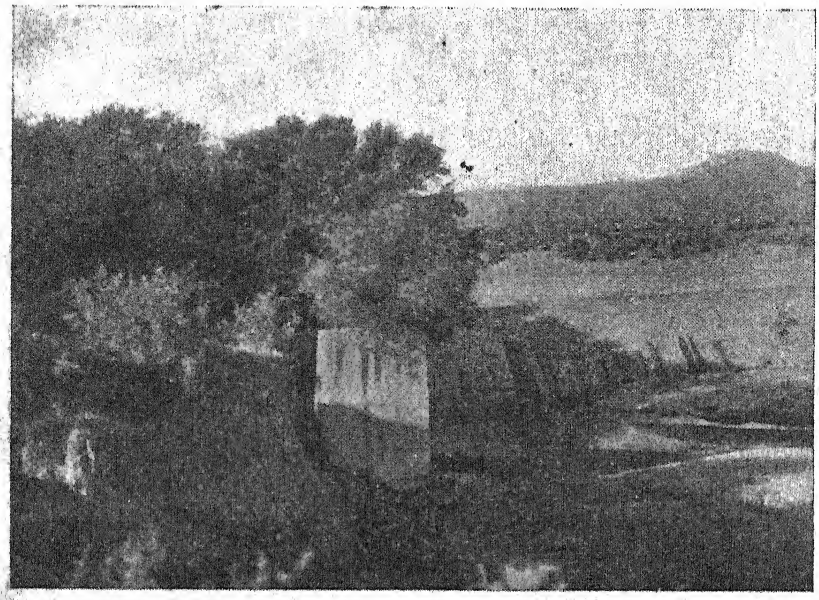


FIG. 1.—Barrier across River bed.
[*Photo J. D. Scott.*

Beaufort West.

On the open, flat Karroo, with sheep farming as the major branch of agriculture, contour embankments have taken the place of dams.

The construction of these contour walls is determined by the topography and the intensity of prevailing thunder storms in conformity with the lie of the land. These works occasionally show variations in the form of weirs and other barriers across river-beds, the object being to spread the water over wider areas for longer periods in order to promote better penetration and prevent erosion. In adopting this system, it is essential to do the work thoroughly, so as to withstand the maximum run-off. If one of the component walls should break, it is likely that the whole system connected with it may collapse. Apart from the sound judgment as to where and how to erect the contours, the engineer relies upon his levelling machine.

Poorly-vegetated areas, with a low and erratic rainfall, cannot show convincing results at an early stage, since the mechanical process

of throwing up embankments is apt to pulverise the soil, thus spoiling its structure, and much of this dry material stands the risk of being blown away. Naked and unprotected, the soil must have wonderful recuperative powers to recover its original flora. Mexican poppies, melkbos and wild tobacco usually have good innings during these initial attempts of revegation. On poor flat country a thin layer of water behind contours is likely to bring the salts to the surface,

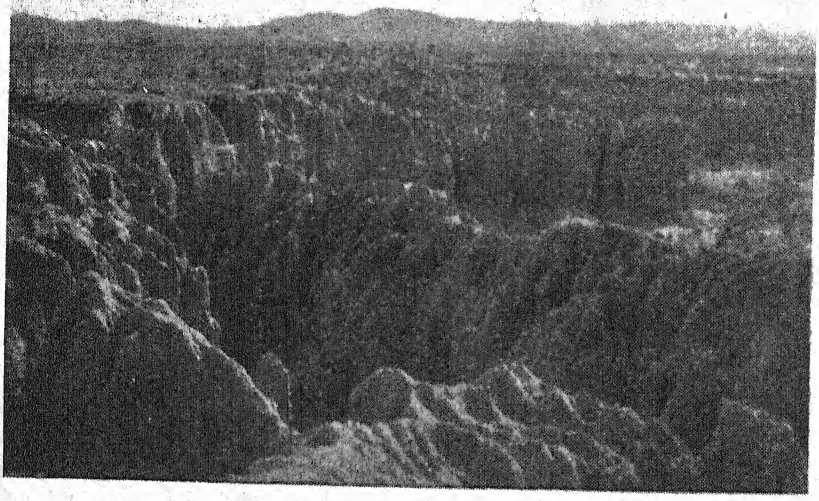


FIG. 2.—Where Soil Erosion is mounting at the rate of Compound Interest. [*Photo J. D. Scott.*

or, after evaporation, leave a layer of badly aerated impervious clay. These conditions are poisonous to the complicated biological activities in the soil.

A stereotyped system of walls in itself will not solve the problem of soil conservation. It must be supported by a sound policy of animal and field husbandry. When a partial recovery of the veld is in evidence, it should not be spoilt again by over-grazing. Quite a number of farmers who have worked under the scheme frankly admit that they are stocking too heavily.

There are quite a number of instances where barriers across rivers force additional quantities of water through a system of contour walls. Being more than the veld can absorb, the surplus is utilized to grow a crop of wheat or to irrigate lucerne fields. Where practicable, this is a good idea, but preference should be given to lucerne because it is highly speculative whether ploughed-up veld under wheat is more valuable than the indigenous plants.

Lucerne possesses much better qualities for improving soil and preventing erosion than wheat, but apart from that, it forms a valuable supplement to the carrying capacity of the farm. A good supply stored up must come in very useful at critical times and lessen the burden on the veld.

Victoria West.

Coming to the district of Victoria West, one crosses the watershed of some of the principal Karroo rivers. From this enormous catchment area rivers start running in opposite directions finally discharging into the Atlantic or Indian Oceans. Looking at these rivers when in flood, the silt-laden water depicts the condition of the sheep farms. Where do we stand with soil conservation when tons of the most valuable surface soil are being washed down with each rain? Water from these rivers is usually so muddy that farmers have to be very careful when using it for irrigation purposes. These rivers, however, run intermittently, and very soon after a spasmodic flood settle down to dry sandy river beds again.

Travelling long distances from one work to another, one realises how widely they are scattered and that there are miles and miles of intervening veld heavily stocked with sheep. The toll of erosion mounts steadily at the rate of compound interest. The Government alone cannot cope with the enormous task and can do little to alleviate the position without the wholehearted and active support of the farming community as a whole.

Many farmers have on their own initiative already achieved outstanding success with soil and water conservation, but, as a percentage of the total farming community their number is negligible.

Britstown.

In this district the majority of the schemes built according to specification are satisfactory and the applicants are pleased with the results. On one estate the completed works have been very well designed and are showing promising results. In this case it was found

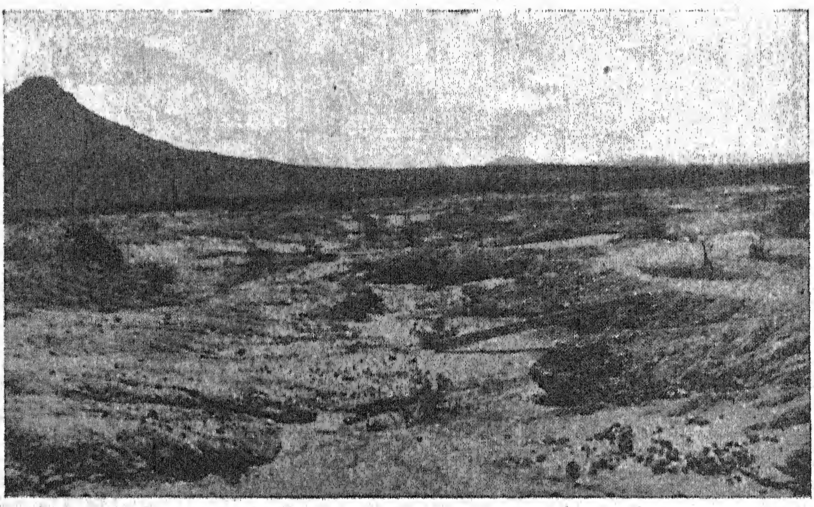


FIG. 3.—Tons of Surface-soil being washed away.
[*Photo Cp. McGowan.*

necessary to depart from the monotony of the standard-size walls by building them higher, so that the water reaches a greater depth before discharging over the cement weirs which serve as a spillway to the original river-bed.

The greater the quantities of water these schemes can retain, the better. With this in view, it will perhaps be advisable to scoop soil

from the upstream-side only. The deeper the excavation, the more water it will hold, whereas scraping on the down-stream side will leave long strips of veld exposed to scouring. Trees should also be planted along the high-water level of these contour-dams; they will give shelter to animals, arrest winds and reduce evaporation.

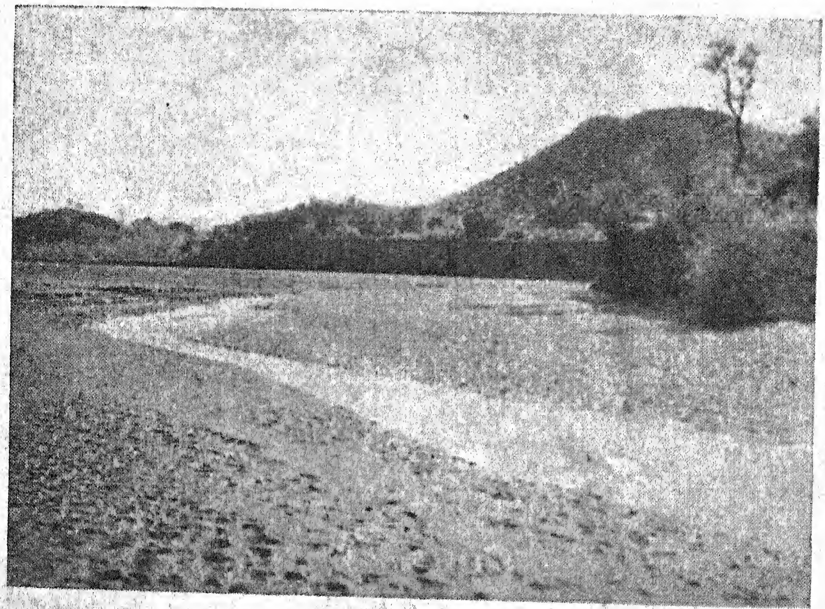


FIG. 4.—A Dry Sandy River-bed.
[Photo J. D. Scott.

On one farm there is an ingenious combination of windmills and contouring turned into "saaidamme". Perhaps contouring only was in the minds of the designers originally, but afterwards realising the flatness of the country, and having in addition an extra supply of water from seven windmills within convenient proximity, they switched over to wheat and lucerne. With a reliable water-supply, the agricultural production on the area concerned has now increased substantially.

According to the nature of the scheme it is reasonable to accept that the Departments concerned have leaned more towards mechanical control, and it is therefore incumbent upon the applicants to exercise judgment and common sense in the up-keep of these works since the improvement of badly eroded land is necessarily a long, slow and involved process. Farmers must themselves see to the necessary repairs because the Department cannot keep an army of engineers to supervise the works under construction as well as to keep an eye on the maintenance of those completed.

Legumes as a Feed for Livestock.

E. D. Adler, Lecturer in Animal Husbandry, College of Agriculture, Glen.

THE growing of legumes is essential in a mixed and balanced farming system, for legumes are not only the most important source of protein-rich supplementary or winter feed for stock, but also one of the principal links in the system of crop rotation for the purpose of maintaining soil fertility.

Proteins, which contain nitrogen, are of the utmost importance both in the human diet and for the feeding of livestock, since they are necessary for the building up and existence of every cell of the human or animal body.

In the diet of mankind the protein-rich foods such as milk, cheese, meat and eggs are always more expensive per pound of dry matter than the carbonaceous foods like maize, wheat, potatoes and rice. To-day the demand for protein foodstuffs is greater than ever before, but our farm animals can produce them for us only if they receive the necessary quantity and quality of proteins in their rations.

Protein-rich Plants.

That group of plants known as legumes, which includes all types of beans such as soy, kaffir, mung, sugar, tepary and harricot, and also crops such as groundnuts, lucerne, peas, and clover is rich in proteins. A few comparative feeding values are given in Table 1.

TABLE I.—*Comparative Feeding Values.*

Feed.	Dry Matter.	Digestible Protein.	Total Digestible Nutrients.
	Per Cent.	Per Cent.	Per Cent.
Teff hay	80·9	4·6	56·6
Cowpea hay	90·3	13·1	49·0
Lucerne hay (before bloom)	90·4	14·2	53·2
Lucerne hay (after bloom)	90·4	8·6	44·9
Maize (grain)	87·8	7·7	84·2
Soybeans (seed)	90·2	32·8	86·2
Cowpea (seed)	88·6	19·4	76·5
Silage (maize)	26·3	1·1	17·7

Good legume hay, therefore, contains about three times as much digestible protein as a grass hay such as teff.

Proteins are built up from certain chemical combinations known as amino acids. We know to-day that certain essential amino acids are abundant in legumes but relatively scarce in the common well-known feeds, like teff, sweet grass and other grass hays and maize. The protein found in legumes supplements very effectively the deficiencies in the protein of the cereal grains. Legume hay is exceptionally rich in minerals and contains more calcium than most of the usual feeds. It is, however, not too well supplied with phosphorus, and farmers are advised to continue feeding bonemeal as in the past, according to proved and well-known methods. Legume hay is also a rich source of the two important vitamins A and D.

By making proper use of legume hay, the supplementary feeding of bought protein concentrates to high-producing or growing stock

may be partially or completely obviated, depending on the production and type of animal fed.

Our aim should be to produce the maximum quantity of legumes for seed and hay which we can produce economically. It may cost the farmer more to produce a ton of cowpea or soybean hay than a ton of teff hay, but if he were to compare the values of these hays for feeding his stock, he would most probably find that it pays handsomely to produce legume hay. As an example, let us study the winter feeding of a dairy cow. According to Morrison, a dairy cow weighing 1,000 lb. requires for maintenance alone 0·60 lb. digestible protein and 7·0 lb. *total digestible nutrients* per day. For the production of 30 lb. of milk containing 3·5 per cent. butterfat the cow will need an extra 1·14 lb. digestible protein and 8·52 lb. total digestible nutrients daily. For maintenance and production combined the cow will therefore require approximately 1·74 lb. digestible protein and 15·52 lb. total digestible nutrients. Let us assume that the cow can eat between 20 and 25 lb. of dry matter daily, and let us accept the following maximum prices for certain feeds; per 100 lb.: Mealie meal (straight run) 10s.: Teff hay 15s.; legume hay 6s.; and maize silage 9d.

A ration containing legume hay could be drawn up as follows:—

RATION A.

Feed, lb. per day.	Dry Material.	Digestible Protein.	Total Digestible Nutrients.	Price (Shillings).
	lb.	lb.	lb.	
6 lb. Legume Hay..............	5·42	0·79	2·94	0·36
6 lb. Teff Hay................	5·56	0·28	3·40	0·30
33 lb. Silage.................	8·80	0·37	5·90	0·25
4 lb. Mealie Meal.............	3·51	0·31	3·37	0·40
TOTAL..............	23·29	1·75	15·61	1·31

It is impossible to make up a balanced ration for a dairy cow if we have only teff hay, mealie meal and maize silage; but to illustrate the point, let us compound a ration which contains the minimum amount of protein required.

RATION B.

Feed, lb. per day.	Dry Material.	Digestible Protein.	Total Digestible Nutrients.	Price (Shillings).
	lb.	lb.	lb.	
12 lb. Teff Hay...............	11·11	0·55	6·79	0·06
33 lb. Silage.................	8·80	0·37	5·90	0·25
10 lb. Mealie Meal............	8·78	0·77	8·42	1·00
TOTAL..............	28·69	1·69	21·11	1·85

Although ration B is more expensive than ration A and wasteful of maize, a cow would produce no more milk on ration B, the surplus nutrients being turned into body fat. It unfortunately happens all too frequently in practice that maize is used in this indiscriminate

and uneconomic manner. More legume hay and less other roughages should be given to cows producing more than 3 gallons of milk daily. The American Friesian cow "Carnation Ormsby Madcap Fayne", which produced nearly 42,000 lb. of milk in 365 days, consumed 35 lb. of lucerne hay per day, quite apart from green feed and concentrates.

To-day there is a shortage of oil-cakes and other protein-rich concentrates, and if those farmers who are feeding cows which yield less than 3 gallons of milk daily, would produce and feed more legume hay, they would improve the productivity of their own cows and, at the same time enable those farmers who have high-producing cows to obtain sufficient protein concentrates to feed their animals.

Legume hay is also valuable for other classes of stock. The protein requirements of growing animals and slaughter stock are less than those of dairy cows. If we gave 6-8 lb. of legume hay to growing heifers, dry pregnant cows or cattle to be fattened, no protein concentrates would be required in their rations.

Legume Hay Meal.

In the past it has seldom been advocated that hay should be ground. It would not pay under present circumstances to grind teff or similar hays, but it may sometimes be advisable to grind a legume hay into a meal.

Suppose, for example, that you have an abundance of teff hay, but just a very limited amount of cowpea hay and that you have to feed a group of 3-gallon cows for six months. It would certainly not be good policy to feed the cowpea hay liberally for a short period and then the teff hay alone for a longer period. What would be advisable would be to calculate what quantity of cowpea hay could be fed daily over the whole period of 6 months. Let us assume that this works out to 5 lb. per cow per day. Grind the cowpea hay into a meal and mix 5 lb. of the meal with mealie meal and other concentrates required and feed the whole mixture as a concentrate in the manger. Supplement this ration with teff hay. If this is done there will be a minimum wastage of valuable legume hay.

Pigs cannot digest large quantities of roughages, but those confined to a sty or not getting sufficient green feed can make excellent use of legume hay meal. A portion of the protein in the ration may consist of legume hay and it is recommended that 5 per cent. legume meal be incorporated in the ration. As an experiment, which proved to be a success, young pigs at Glen were fed exclusively on skimmed milk, molasses and lucerne meal. It was found however, that the ration was improved when a portion of the molasses was replaced by maize. At five months of age each pig consumed 2 lb. molasses, 2 lb. mealie meal, 10 lb. skimmed milk and 1 lb. lucerne meal.

Horses can also make good use of legume hay which supplies the very best form of protein to the hard-worked horse or the mare with foal.

Hard-skin in Peas.—

[*Continued from page* 768.

These results are quite contrary to expectations, since soft peas from soft parent plants showed no decrease in the percentage of hard-skin seeds present.

It was also noteworthy that pea varieties which contained no hard-skin seeds the previous year, showed approximately 3 per cent. hard-skin seeds in 1941, on adjacent test plots. We must, therefore,

come to the conclusion that climate as well as soil, has an effect on the incidence of hard-skin. Gloyer([4]) found in this connection that low humidity at harvesting time was conducive to the occurrence of hard-skin. Storing seed in a very hot room also increases hard-skin and should, therefore, be avoided.

It is significant that most complaints had reference to seed from Upington, where humidity is relatively low. On the other hand, very satisfactory results were obtained from peas grown in the Ceres district. A thorough investigation of hard-skin consequently calls for tests in different areas.

Hard-skin is, therefore, not a question of poor seed only, as is so widely believed. Soil and climate seem to play a decisive role. Our tests have up to the present shown that heredity has no effect on hard-skin.

We do believe, however, that the quality of the variety can be improved by selection in order to eliminate hard-skin. The matter will be further investigated with this object in view and from this year onward, attention will also be given to the problem in so far as lupin seeds are concerned.

LITERATURE.

(1) Hard seeds in Legumes—W. O. Whitcomb. (Bull. 258, Jul. 1931. Montana State College, Montana).
(2) Journal of Agric. Res. Vol. 51: 365-370 (1935).
(3) Journal of Agric. Res. Vol. 53: 869 (1936).
(4) Percentage of hardshell in Pea and Bean varieties—W. O. Gloyer. (Bull. 195, April 1932. Cornell Univ).

Poultry Rations without Wheaten Bran and Pollard.—

[Continued from page 784.

The average production figures must be regarded as exceedingly poor. The reason for the low figures must be sought, in the first place, in the amazingly large numbers of eggs eaten by birds in the last three groups. This was also noticeable in group 1, but was inexplicably high in the last three groups. Even the cocks ate eggs. At one stage the position became so serious that each egg was eaten directly it was laid. The low average figures must, therefore, in the first place be ascribed to this habit.

Feather-eating ocurred in all the groups but was most marked in groups, 2, 3 and 4. In the latter three groups it was so severe that the hens were almost bare at the end of the experiment. This abnormal occurrence must definitely have exercised an adverse effect on production. The following are the mortality figures in the various groups and the percentage of hatchability of fertilized eggs:—

	Per cent. Mortality.	Percentage Hatchability of fertilized eggs.
Group 1	8·3	65
Group 2	18·3	64
Group 3	15·0	57·1
Group 4	20·0	52·7

Even the hatching results of the various groups are in favour of ration No. 1 as indicated above.

From the above figures it is clear that wheat and wheaten products played a larger rôle in our poultry rations than they were given credit for. The value of these products apparently lies in their vitamin content and the biological value of the proteins.

Controlling Late Blight in Potatoes.

Dr. Vincent A. Wager, Acting Officer-in-Charge, Botanical Station, Durban.

SERIOUS losses in potatoes are frequently caused by the disease known as Late Blight*. In some instances this blight has completely destroyed the crop, and one often hears of farmers having such low returns as one bag from a case of imported seed.

A Dusting Machine in Action.

Fortunately, Late Blight occurs only in a few places in South Africa, since it requires cool, wet conditions for its development. It is thus mainly the concern of those farmers who grow seed potatoes in the highlands of the Transvaal, for example at Haenertsburg, and of Natal, in the Mooi River, Donnybrook and Underberg areas.

Generally, it is the first crop from imported seed which suffers most. The imported seed comes mainly from Scotland and cannot reach South Africa much before the middle of December or January, sometimes even later. This crop, then, matures during the latter part of summer, and rainfall figures from Underberg† for the past fifteen years have shown that heavy rains can be expected at this time, the average being over 7 in. for January, 6 in. for February and 5 in. for March. The figure may even be as high as 12 in. for a month, with rain falling on practically every day. Under conditions such as these, Late Blight would simply sweep through a crop and completely destroy it, not only killing off the tops, but also turning the tubers into a rotten slimy mass.

Early Blight and Late Blight.

Late blight should not be confused with Early blight‡, a disease which attacks potatoes anywhere in South Africa, and at

* Due to the fungus *Phytophthora infestans*.
† Kindly supplied by Mr. R. I. P. Vaughan.
‡ Caused by the fungus *Alternaria solani*.

any time of the year. It is characterized by the appearance on the leaves of brown and black spots, usually with concentric markings. Late blight is found in the form of large brown or black blotches, and, during damp weather, there is a white mould (consisting of countless spores) on the underside of the dead areas. Early blight may also cause extensive losses by prematurely killing off the leaves and thus lowering the yield of tubers. Both diseases can be controlled in the same manner by dusting or spraying with copper fungicides.

Field Observations.

Observations in the seed-potato growing areas of Natal during the past season have brought many interesting facts to light, showing that the incidence of Late blight may be due to various causes. The disease usually appears shortly after a heavy rainstorm, for, when the fungus reproduces itself, its spores must be able to swim around in water, and are thus splashed up from the soil on to the leaves, or from one leaf to another. The disease was seen to be worse in heavy soils where puddles were formed between the rows, and remained perhaps for a day or so. Spores would be produced in this standing water and would readily be splashed up on to the foliage by the next storm. In sandy soil, or where furrows were on a slope and the water ran off rapidly and did not have a chance to stand, much less blight developed.

Aspect also plays a part, for fields which are situated in hollows, or are protected by trees, do not dry out so quickly and are therefore more severely attacked by blight than those in exposed positions where there may possibly be a prevailing wind which would soon remove the dew or raindrops from the leaves.

Blight is also found in patches in a field. One patch was some twenty yards long by ten wide, and the disease had turned all the leaves brown, killing practically every plant. The surrounding plants were green and vigorous, although odd spots of infection were seen here and there. The disease develops and spreads exceedingly rapidly; farmers often mention how beautiful a certain field looked, and how it was all brown and blighted a week or so later.

Control Measures.

Potato growers throughout the world have been advised for years to control blight with copper sprays or dusts. Increases in yield, even up to two tons per acre following such treatment have been reported from time to time, but no real facts of South African experience have yet been presented to farmers. During the past season experiments were carried out at Donnybrook and Underberg*, in the highlands of Natal, to test the efficacy of copper dust.

The dust used was copper oxy-chloride (containing 16 per cent. copper) and it was applied through a hand-worked rotary duster. The crops used were the late ones of imported seed planted in January and February.

The Underberg experiment was abandoned as the crop was completely destroyed by hail.

At Donnybrook, four rows each 300 yards long were dusted, six rows were left untreated as controls, another four were dusted, and finally six controls. Only the two middle rows of each treatment were considered. At the time of harvesting, each row was divided into six parts and each 50-yard section was lifted and weighed in turn.

* Thanks are due to Mr. N. Harris and Mr. R. I. P. Vaughan for their help in carrying out this work.

The four dusted rows (equivalent to ¼ acre) yielded 2436 pounds whilst the controls gave 2008 pounds of potatoes, this being an increase of 428 pounds, or 17 per cent., equivalent to 11½ bags (of 150 lb. each) per acre. Seed potatoes being worth 35s. per bag at the time, this meant a profit of £20.

It was estimated that the dust was applied in this instance at the rate of 70 to 80 lb. per acre, the dusting costs amounting to roughly £2. The labour costs would be very small, for dusting is a rapid process.

The first dusting was near the end of February, and there were altogether seven treatments in six weeks. During this period there was over six inches of rain and two hailstorms which cut the plants up considerably—ideal blight conditions except that the soil was light and friable, and water did not stand on it. Actually the control rows must have got considerable benefit from the treatment, for the dust was applied at a heavier rate than necessary and there was a considerable drift of dust due to the slight prevailing wind, even early in the mornings. Thus, all facts considered, the results were fairly good.

General Recommendations.

The secret of success is to dust the *first* morning after each rainstorm, or immediately there is a break in the weather. Do not let more than four or five wet days go by without dusting, even if it means doing it during a slight drizzle. Rather delay dusting until the first sign of the blight is noticed in the crop, then perhaps do so two or three times in one week if weather conditions warrant it. In dry weather one treatment every ten days or two weeks should be sufficient. The crops should be dusted from five to eight times during the season, depending on weather conditions, and the dust should be applied at the rate of five to ten pounds per acre per treatment. Always commence dusting the first thing in the morning while the plants are wet with dew or rain, and before a wind comes up.

An important point is the necessity for keeping the dust in the warmest and driest place on the farm (perhaps the kitchen). During wet weather the dust becomes moist and clogs in the machine.

According to enquiries, the supply of dusting machines at present on hand is very limited; the cost of such machines being in the neighbourhood of £5, but there is no shortage in copper dust, such as copper lime, copper oxy-chloride and copper hydro, which cost about 6d. per lb. in bulk.

Production of Grass Seed.—

[*Continued from page 762.*

where farmers cannot manage the process themselves. The current prices for seed depend upon its cleanness and germinating qualities, and seed producers should bear this in mind. It may be found to be of great advantage if farmers could arrange among themselves the common use of such machines as some of them may possess.

Farmers can market their own seed, either through associations or individually, or they may sell to merchants who will undertake the marketing. Seed producers may also consider the advisability of producing under contract (with some merchant or other) in order to eliminate all marketing difficulties.

For proper control of production, seed producers should keep in touch with the extension officers of the Department. Further information in this connection is obtainable from the Chief, Division of Soil and Veld Conservation, P.O. Box 965, Pretoria.

Fertilizers for Vegetables.

IN an article, "The New Fertilizer Mixtures", which appeared in the March, 1942, issue of "Farming in South Africa", general information is given on the analyses and main qualities of the 8 fertilizer mixtures A to H, the only ones available at present. In view of their scarcity and high cost, growers are advised not to apply fertilizers wastefully. However, this does not necessarily mean using less fertilizer and starving crops, but using the most economical quantity of that fertilizer best suited to the particular crop and the conditions concerned. The plants should also be provided with the best possible conditions in order to make the best use of the fertilizer. This can be done by paying particular attention to such factors as soil preparation, irrigation, weed, insect, and disease control, and crop rotation.

In order to assist the grower of vegetables to do this to the best advantage, more information with regard tot the requirements of specific crops is given below.

No hard and fast fertilizer practice can be recommended since the kind and quantity of fertilizer to apply will depend on a variety of factors such as: natural soil fertility, residual effect of fertilizers applied to previous crops, weed growth, and the growing of leguminous cover crops beforehand. However, the following rules of application per morgen should serve as a general guide for vegetable crops under irrigation.

For legumes, such as green beans and peas, apply up to 15 to 20 tons of kraal manure or compost according to soil fertility, plus either 600 to 800 lb. superphosphate or 800 to 1,000 lb. of fertilizer mixture C.

For leaf crops, such as cabbage, cauliflower, spinach, and lettuce, apply 20 tons of kraal manure or compost plus 1,000 to 1,200 lb. of either fertilizer mixture D or E.

For tomatoes and brinjals, apply 20 tons of kraal manure or compost plus 1,000 to 1,200 lb. of either fertilizer mixture C or E.

For rootcrops, such as beet, carrots, potatoes, onions, and sweet potatoes, apply up to 20 tons of kraal manure or compost according to soil fertility, plus either 800 lb. superphosphate or 1,000 to 1,200 lb. of fertilizer mixture B.

For cucurbits, such as cucumbers, marrows, pumpkins, and squash, apply 10 to 15 tons of kraal manure or compost plus either 400 to 600 lb. superphosphate or 600 to 800 lb. of fertilizer mixture C.

The nitrogen in these mixtures is supplied either in the organic or the inorganic form. Though the organic form of nitrogen is slightly more expensive, this extra expense is warranted under conditions where loss of nitrogen due to leaching is liable to occur. On the other hand, the nitrogen in the inorganic mixtures is more readily available and is used when a quick response is desired.

Farmers are advised to provide and to make full use of compost or manure and covercrops wherever possible. Should these not be procurable, the recommended fertilizer mixtures should be increased by about 30 per cent.

For all small-rooted crops, such as the cucurbits, leaf-crops, legumes, and rootcrops, the fertilizers and manure are well mixed with the soil in the planting furrows or beds, whereas for tomatoes brinjals, and other crops with comparatively large root systems, the manure and fertilizers are broadcast.

(J. C. le Roux, Professional Officer, Division of Horticulture.)

Agro-Economic Survey of the Union.

III. The Grazing Areas of the Eastern Mountain Watershed Areas 3A, 3B, and 3C.

Compiled by G. J. C. Uys, Division of Economics and Markets.

THIS area straddles the high mountain watershed in the eastern part of the Union, approximately 100 miles from the east coast and more or less parallel to it. It is a long narrow strip, being more than 600 miles long and only 70 miles wide at its broadest point. It is divided lengthwise in three grazing areas.

Demarcation of Three Grazing Areas.

(1) *The Drakensberg Grazing Area* (3A) is situated between the lower-lying *Eastern Transvaal Irrigation area* (2C) in the north (more or less on the same latitude with Lydenburg) and Basutoland in the south (see map). It is bordered in the east by the warm low-lying areas of Transvaal and Natal and in the west by the more level arable areas of the Transvaal and Orange Free Stte.

(2) *The Stormberg Grazing Area* (3B) is the continuation of the Drakensberg range to the south of Basutoland and includes the small portion of the Drakensberg lying east of the Basutoland border. This area is bounded on the west by the dry, more level Karroo area, on the south by the less mountainous *Queenstown Diversified Farming Area* (7) and on the east by the lower-lying Diversified Farming areas of Natal and the Eastern Cape Province (4C, 4D, 4E.)

(3) *The Winterberg Grazing Area* (3C) is a detached mountainous area divided from the *Stormberg Area* by the lower-lying and more level *Queenstown Diversified Farming Area* (7).

Altitude and Topography.

The Drakensberg and Stormberg Areas (3A and 3B) are almost everywhere more than 5,000 feet above sea level. In the first-mentioned area there are mountain peaks exceeding 7,000 feet while there are peaks of over 9,000 ft. in the latter area. The *Winterberg Area* (2C) also lies at a high altitude, although its southern boundary is roughly determined by a line running at an altitude of approximately 3,000 feet above sea level. It is a mountainous area which offers very little facilities for soil cultivation and is suitable mainly for summer grazing.

The Drakensberg Area (3A) has the high Steenkamp Mountains on the north and is relatively flat between Belfast and Sheepmoor (Ermelo). From here, however, southwards, the Drakensberg range becomes prominent again. On the eastern side of the mountain range the sudden fall causes an uneven succession of foothills while the fall on the western side is not so abrupt and the surface gradually becomes more level: *The Stormberg Area* (3B) has the high Witteberg range on the north, the Drakensberg on the east and the lower Stormberg mountains on the south. The westward flowing Kraai river with its tributaries has carved deep valleys out of this hilly country.

Rainfall and Temperature.

The average annual rainfall over the major portion of this area is between 30 and 35 inches. It is on the whole higher on the eastern slopes of the mountain watershed and diminishes towards the west.

In the *Stormberg* (3B) and *Winterberg* (3C) areas especially, the rainfall drops rapidly to the west and south as the altitude decreases. These three areas are the highest and coldest in the country. Snow storms are by no means uncommon during winter. Unseasonable frost occurs even during the summer months and causes damage to crops and fruit. Sometimes exceptional cold also causes serious stock losses on exposed veld.

Soil Types.

Since the area, generally is very uneven and mountainous, the soil is, on the whole, too shallow, gravelly or sloping for cultivation. The mountain soil is, therefore, usually leached and acid but on the more level ridges between the hills and in the valleys deeper arable soil is found.

A fair amount of poor sandy soil is found *in the Drakensberg Area* (3A) between Belfast and Ermelo. Most of the cultivation is done on the sandy loam to loam soils of this area. In the Orange Free State portion of this area especially, grey, clayey loam soils are fairly common. They are derived from shale and although these types of soil are quite fertile, they are relatively compact and inclined to dry out rapidly. The black turf or red soils are derived mostly from dolerite which, in its unweathered condition, occurs as red ironstone ridges.

In the Stormberg Area (3B) the geological formation is clearly visible in many places. The curious weathered cave-sandstone underlies basalt at a height of about 6-7000 feet. The result is light sandy soils derived from the first-mentioned stone while the basalt weathers to a blackish-brown crumbly loam soil. The latter soil is used mostly for the cultivation of fodder crops. Dolerite outcrops with their characteristic soil types also occur in this area. On the whole, however, arable soil is limited in this mountainous area. On the *Winterberg* (3C), soil cultivation by European farmers plays an unimportant rôle.

Vegetation.

A thick grass cover is found over the whole area. Indigenous trees are to be found only in the mountain ravines and consist mostly of valueless shrubs such as "ouhout" (*cordia caffra*). The grazing varies according to the soil fertility and is usually sour on shallow mountain soils (being particularly sour on the southern slopes) and sweeter on the flats and level ridges with deeper soil. The basalt soil in the *Stormberg Area* (3B) usually provides good grazing and has an exceptionnally high carrying capacity. On the whole, the veld on the Winterberg is sour and suitable only as summer grazing.

The following grass varieties are characteristic of the sour veld: *Heteropogon*, *Andropogon* (bitterpol), *monocymbium* (oat-grass) *Trystachya*, *Harpechloa*, *Elionurus* (suurpol), *Alloteropsis* and others. *Themeda triandra* (red-grass) is predominant in the sweet-veld, although several short *Eragrostis* varieties are also found. Various *Aristida* (stick-grass) varieties grow on the hard gravelly soil.

Veld Control.

During winter the grass of the whole area is killed by frost and the animals are also exposed to the cold. The custom has, therefore, originated of trekking with the stock during winter to the lower and warmer veld on the east of the mountain watershed. The fencing in of the main roads and the more intensive farming practised in the

winterveld area are making this trekking more difficult and the custom is, therefore, slowly disappearing.

This has accentuated the major problem over the whole area, namely, provision of winter feed for stock. Consequently, this shortage of feed during winter is at present as far as possible, being supplemented by providing green feed and other feed varieties which can be stored, like hay, silage, pumpkins and root crops. Grass-burning, especially on sour veld, in order to obtain green grass during early spring, is a general practice. Grass is also burnt from January onwards in order to get green grazing during the latter part of the summer, especially for lambing ewes.

Diseases and Pests.—On account of its high altitude, this area is one of the healthiest in the country for stock. On farms with vleis, however, sheep are more readily infested with internal worm parasites and liver fluke.

Farming Systems.

Throughout the grazing areas, stock farming occupies the most prominent position. Where the cultivation of crops is possible, it is carried out in the first instance in the interest of stock farming. The *Winterberg Area* (3C) differs from the other two areas mainly in that it consists almost solely of summer farms belonging to farmers living in the surrounding lower-lying parts; it is, therefore, grazed during summer only. A large portion of this area, furthermore, constitutes the Fingo Location. It was, for this reason, impossible to gather sufficient data on farming systems to present a representative survey of this area. Only the *Drakensberg* (3A) and *Stormberg* (3B) areas will, therefore, be compared statistically.

Farm utilization.—Farms in the grazing area are relatively extensive viz., an average of 1177 morgen in the *Drakensberg Area* (3A) and 1226 morgen in the *Stormberg Area* (3B). If the farms are divided in groups of 500 morgen, then most farms (about two-thirds) in both areas fall between 500 and 1,000 morgen, while in both instances only 15 per cent. of all the farms are over 2,000 morgen in extent. In both areas an average of 5 morgen is under *irrigation.* Irrigation is usually possible on the lower-lying farms which have water from the mountain springs at their disposal. In the Drakensberg area 147 morgen per farm are cultivated as *dry lands* as against 70 morgen in the Stormberg area. In the former area natives receive an average of 24 morgen in lands per farm, whereas it is not a common practice in the latter area to compensate labour by providing lands.

In both areas by far the greater portion is used for grazing. It is interesting that in both areas the percentage of ground cultivated on the smaller farms, i.e. those less than 500 morgen in extent, is twice as large as that cultivated on the larger farms of more than 2,000 morgen each. Although more ground is brought under cultivation as the farms increase in size, the percentage of cultivated ground in relation to the total extent of the farm gradually diminishes. There is a tendency to divide farms possessing possibilities for crop production into smaller portions; in addition it is more essential and sometimes more practicable for the farmer having a smaller farm to cultivate it on a more intensive scale.

Farm Values.—The average market value of farms in the *Drakensberg Area* (3A) was £4·1 per morgen in 1936, and in the *Stormberg Area* (3B) £5·3 per morgen in 1939. In both areas, however, the prices of farms vary between wide limits, according to the extent and quality of arable ground, the quality of the grazing

and the improvements effected. In the case of both areas the average value of improvements amounts to 21 per cent. of the total farm value. Although larger and more expensive farms have a higher improvement value, the percentage of improvement value in relation to the total farm value decreases as the farms increase in extent. In the *Drakensberg Area*, farms less than 500 morgen in extent, owe 29 per cent. of their total value to improvements, and in the *Stormberg Area* 34 per cent., while for farms exceeding 2,000 morgen in extent the value of improvements is 19 per cent. and 18 per cent. of the total value, for the two areas respectively. The farms are generally well fenced and divided into camps. As a rule the buildings and dwelling house on the farm are attractively and substantially built of dressed sandstone, which is obtainable practically everywhere in the abovementioned two areas.

Crops.

Maize and Wheat.—From Table 1 it will be seen that, whereas maize enjoys priority amongst the crops in the *Drakensberg Area* (3A)—71 morgen per farm or 52 per cent.—wheat is the principal crop in the *Stormberg Area* (3B), viz., 32 morgen per farm of 37 per cent. In the former area, however, little maize is grown on the actual mountain farms, being produced mainly in the western portion of the area, adjoining the crop-production areas. In the *Drakensberg Area* (3A) approximately 7·5 morgen is put under wheat and in the *Stormberg Area* (3B) only 7 morgen per farm is planted to maize. Fodder crops, especially green feed for winter, such as oats and rye, play an important rôle in both areas.

The average yield of maize over a period of three years is 333 bags per farm or 4·7 bags per morgen in the *Drakensberg Area* and 23 bags per farm (3·4 bags per morgen) in the *Stormberg Area*. In the latter area practically the entire maize crop, being small, is utilized on the farm, whereas in the former area 150 bags or 45 per cent. are marketed. The low yields prove still further that it is no maize-producing area.

Wheat is sown primarily for green feed for lambing ewes, but in a favourable year, the crop is also harvested. Wheat yields also tend to be uncertain. In the *Stormberg Area* the average yield of wheat is only 1·9 bags per morgen, and in the *Drakensberg Area* 4 bags per morgen. The greater portion of the wheat crop is usually marketed.

Other Market Crops.—In the *Drakensberg Area* beans are grown chiefly on the sandy soils in the neighbourhood of Belfast and Carolina. In this area potatoes are grown almost exclusively for home consumption.

Winter Fodder Varieties.—Of the crops sown exclusively for winter pasturage oats is the most important in both areas. In good years, however, the second growth is threshed. Rye and other cerals, such as barley, are also sown, but on a much smaller scale than oats. Italian Rye Grass is sown, especially in the *Stormberg Area*, for winter grazing.

Rootcrops.—Turnips and to a lesser extent, root-crops such as mangolds are grown in the *Stormberg Area* (6·5 morgen) especially for feed during the dry winter season.

Hay Feeds.—In the Drakensberg area a considerable amount of teff (15·4 morgen per farm) is sown for hay-making purposes. In the Stormberg area, however, lucerne (5·5 morgen) is grown as a hay crop.

Table 1.—*Area under Crops. Average per Farm in two Grazing Areas.*

	Drakensberg. Grazing area.		Stormberg. Grazing area.	
	Morgen.	Percentage.	Morgen.	Percentage.
Maize	71·1	51·6	6·8	7·9
Wheat	7·5	5·4	31·6	36·7
Beans	1·7	1·2	—	—
Potatoes	0·5	0·4	0·3	0·4
Oats	31·7	23·0	17·2	20·0
Rye and other winter cereals	2·5	1·8	10·3	12·0
Italian Rye Grass and established pasture	—	—	5·5	6·4
Turnips and other root crops	1·4	1·0	6·5	7·6
Teff	15·4	11·2	0·2	0·2
Manna	0·6	0·4	—	—
Lucerne	—	—	5·5	6·4
Other Fodder Crops	2·9	2·1	2·1	2·4
Wattle and other trees	2·4	1·7	—	—
	137·7	100·0	86·0	100·0

Other feeds.—Various other crops are grown for feeding purposes, for example, maize for silage, while pumpkins and kaffir watermelons are sown between the maize on the lands. Cowpeas are planted on a very small scale in this area. Buckwheat is grown in the Bothasberg district of the *Drakensberg Area* especially where it is harvested mainly for the market. Here and there attempts are made to grow kale on a small scale.

Wattle and other Trees.—The area lies too high and is too cold for wattle plantations. The morgenage under wattle and other trees, as shown in Table 1 in respect of the *Drakensberg Area*, was surveyed more particularly on farms lower down along the eastern portion of the mountain watershed, as, for instance, in the neighbourhood of Sheepmoor.

Stock Farming.

Stock farming in the grazing areas consists mainly of sheep and cattle farming (Table 2). In the *Drakensberg Area* (3A), however, cattle farming is on a larger scale than in the *Stormberg Area* (3B). In the former area the number of sheep is predominant to the extent of eight sheep to 1 head of cattle, whereas in the latter area the proportion is 16:1. As compared with sheep and cattle, other stock such as horses, mules and donkeys, pigs and poultry play an unimportant part in the farming system. The carrying capacity in terms of large stock units per 100 morgen of farm area, is 33·5 for the *Drakensberg Area*, and 27·4 for the *Stormberg Area*. The carrying capacity of the latter area is probably lower because it is more mountainous and in the West merges into the dry Karroo area.

Cattle Farming.—These grazing areas are exceptionally healthy for cattle and the occurrence of calf diseases is almost negligible. The most serious problem as regards cattle farming is probably the poor quality of the grazing during winter, which, together with the cold, usually causes a severe set-back in condition unless the animals are fed. The average number of calves reared annually per herd of 100 cattle, are 19 in respect of the Drakensberg area and 22 in respect

of the Stormberg area. In most cases cattle farming is on an extensive scale, and on the whole the cattle are not of an exceptionally pure breed. Usually, however, Afrikaner or Friesland blood is predominant in the herds. The cows are as a rule milked off the veld; consequently dairy products are marketed mostly during summer.

In the *Drakensberg area* the total animal income per unit of cattle amounts to £1. 0s. 0d., of which 75 per cent is obtained from the sale of cattle and 25 per cent. from dairy products; in the *Stormberg area* the total income amounts to £1. 10s. 0d., of which 61 per cent. is derived from the sale of cattle and 29 per cent. from dairy products. In the latter area, therefore, cattle farming has shown somewhat more of a tendency to develop in the direction of dairy production and is also more remunerative. Nevertheless, there still remains much room for improvement of the cattle herds and their profitability.

Sheep Farming.—Mainly owing to the cooler climate and consequent decrease in the prevalence of such diseases as blue-tongue the mountain areas are healthier for wooled sheep in summer than the lower-lying areas to the west. Grass of the shorter varieties also grow on the mountains, and is further kept in check by burning so that it can remain suitable for sheep which prefer short veld. It seems, however, as if overstocking with sheep has an adverse effect on veld in a shorter space of time and to a more serious degree than overstocking with cattle. Although few data are as yet available on this subject, it is nevertheless clear that the ratio of sheep to cattle, and a system of rotational grazing with these animals, are important factors in effective veld management in these sloping grazing pasture areas.

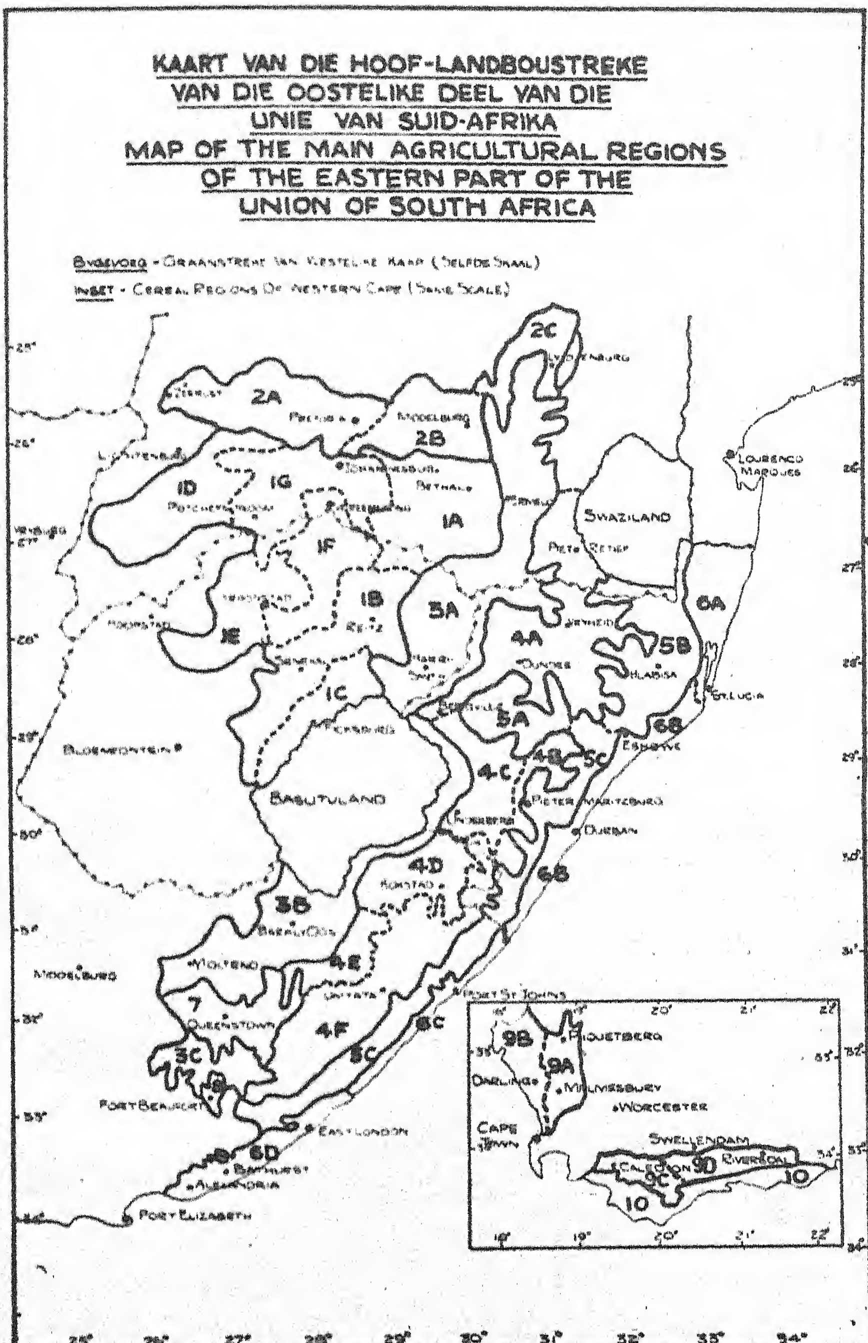
Although the practice of moving to the lowveld during winter is becoming less general, it is still customary for 40 per cent. of the farmers in the *Drakensberg area* and 17 per cent. of those in the *Stormberg area* to trek in winter.

TABLE 2.—*Comparison of number of Cattle, Income per Unit, and Carrying Capacity of the two Grazing Areas.*

	Drakensberg Pasture area.	Stormberg Pasture area.
Extent of Farm (Morgen)	1,177	1,226
Cattle—		
Of owner	157	96
Natives	39	7
Sheep—		
Owner	1,238	1,536
Natives	14	18
Horses and Mules	21	7
Donkeys	6	2
Pigs	5	2
Poultry	86	48
(*) Carrying capacity L.S.U. per 100 morgen	33·5	27·4
Ratio–Number of sheep to every unit of cattle (owners)	8·0	16·0

(*) L.S.U., i.e. Large Stock Units: 1 head of cattle or horse = 7 sheep = 4 pigs = 100 head of poultry.

Internal worm parasites and liver fluke are the most formidable pests with which sheep farmers in these areas have to contend. The nasal fly is also becoming a serious menace during some seasons.



The tape worm is a pest which is particularly troublesome to summer lambs. Keds occur in the area but can be controlled by annual dipping. The blowfly pest is exceptionally severe during wet summers, especially where sheep are seriously worm-infested.

The annual lambing times are in the early winter (April to June) and also the early summer, round about September. September lambing is, however, attended by greater risks, since in dry years

no green feed or young green grass on burnt veld is available. Moreover, such lambs become infested with worm parasites at a younger age than winter lambs and consequently cannot offer as much resistance. Winter lambs are expensive to rear, however, since the lambs and ewes require better feeds during the winter months than dry sheep. In the *Drakenberg area* and *Stormberg area*, respectively, there are in the flocks an average of 36 per cent. and 41 per cent. of ewes capable of lambing. Of these 75 per cent and 74 per cent. lamb, 80 per cent. and 83 per cent. of the lambs reaching maturity. This leads to the conclusion that the *Stormberg area* is slightly better suited to sheep-farming.

In the Drakensberg area there are an average of 1,239 sheep per farm (1·05 per morgen) and in the Stormberg area 1,536 sheep per farm (1·15 per morgen). The wool produced in this highlying and comparatively moist area is usually of good quality and gives a fairly high scoured yield provided the sheep have not too often grazed on sandy lands or been on trek-roads. An average yield of 7·2 lb. of wool per sheep was obtained in the *Drakensberg area* and 9·2 lb. in the *Stormberg area*. A higher price was fetched in the former area, but not in the same season. In both areas, however, 78 per cent. of the income from sheep farming was derived from the sale of wool and the remainder from the sale of sheep. The average income per sheep amounted to 6s. 11d. for each area.

In both areas the lowest income per sheep was obtained on the smaller farms (less than 500 morgen). This figure increases until it reaches its peak in the case of farms falling in the 1001 to 1500 morgen group. In the *Stormberg area* (3B) a decline in the income for sheep is perceptible in respect of groups exceeding 1,500 morgen in extent. On the smaller farms a larger percentage of sheep are slaughtered, so that few sheep are sold. Moreover, it is usually these farms which have developed relatively more in the direction of crop-production, in consequence of which sheep-farming does not receive the undivided attention of the farmers.

Other Stock.—The grazing areas are very healthy for *horses*, although the general retrogression in horse-breeding has also manifested itself in these areas. Although most of the farmers still keep a few breeding mares in addition to their draught and riding horses, they seldom go to the trouble or expense of acquiring a good stallion, partly owing to lack of interest, and partly because the majority of these farmers are not in possession of a sufficient number of breeding mares to justify the cost.

Pigs and Poultry.—On most farms pigs are kept merely for domestic consumption. Poultry, also, are not raised on an extensive scale for marketing purposes. The reason for this is twofold. First, the provision of feed for the two main industries, viz. sheep and cattle, is already a problem which makes it inadvisable to undertake other stock industries which would make even greater demands on the feed supplies. Secondly, this area is situated comparatively far from the large markets, making the marketing of perishable products, such as eggs, difficult.

Consequently the *Drakensberg Area*, being situated close to the Durban and Witwatersrand markets and producing more concentrates, such as maize, has twice as many pigs and fowls as the *Stormberg area*.

Sources of Cash Income.

Table 3 reflects the average incomes derived from the main farming enterprises. It is evident that both areas are dependent

mainly on stock-farming. An average of 15·6 per cent. of the gross farming income in the *Drakensberg area* (3A) is derived from grain-farming as compared with 7·2 per cent. in the *Stormberg area* (3B). This difference is due chiefly to the income derived from maize. In the former area the average income derived from maize is £60 per farm as against £1 in the latter area. The income from stock is £606 and £607 for the two areas. Sheep farming constitutes by far the most important source of income, being responsible for 59·4 per cent of the income in the Drakensberg area and 69·5 per cent. in the Stormberg area. Cattle-farming yields 22 per cent. of the income of each area. The total farm income is £1,177 in the *Drakensberg area* (12s. 3d. per morgen) and £1,226 (10s. 8d. per morgen) in the Stormberg area.

Table 3.—*Sources of Cash Income—Average per Farm for two Grazing Areas.*

	Drakensberg Grazing area.		Stormberg Grazing area.	
	Income.	Per cent. of total.	Income.	Per cent. of total.
No. of Cases	376	—	100	—
Crops—	£		£	
Maize	60·0	8·4	1·0	0·2
Wheat	23·9	3·3	41·1	6·3
Other crops	28·3	3·9	4·8	0·7
Total from crops	112·2	15·6	46·9	7·2
Stock—				
Cattle	151·7	21·5	144·1	22·0
Sheep	426·3	59·4	454·6	69·5
Horses	6·9	1·0	1·8	0·3
Pigs	5·3	0·7	2·0	0·3
Poultry	12·8	1·8	4·5	0·7
Total all stock	606·0	84·4	607·0	92·8
Total from crops and stock	718·2	100·0	653·9	100·0
Size of farm (morgen)	1,177·2	—	1,226·3	—
Income per morgen	0·610	—	0·533	—

A comparison of groups of farms of different sizes reveals that the smaller farms below 500 morgen in extent, yield the largest income per morgen. The percentage of income derived from crops is also considerably higher in this group of smaller farms than in other groups. In the *Stormberg area* the income from crops on groups of farms exceeding 1,500 mogen is insignificant when compared with that derived from stock-farming.

Another fact which emerges is that there is an appreciable increase in the income from sheep as compared with that from other branches of farming, as the farms increase in size.

The mortgage indebtedness on land and indebtedness on improvements and stocks are reflected in Table 4. The total burden of indebtedness is £977 in the *Drakensberg Area* (3A) and £2,144 in the *Stormberg Area* (3B).

TABLE 4.—*Average indebtedness on farms in two grazing areas.*

	Drakensberg Area.	Stormberg Area.
No. of Cases	353	89
Burden of Debt—		
Land £	957	2,058
Improvements £	1	3
Stock £	19	83
TOTAL £	977	2,144
Farm size (Morgen)	1,192	1,308
Debt per 100 morgen £	82	164
Total value of Farm £	4,997	6,892
Debt per £100 fixed capital £	26	31
Total income £	725	700
Income per £100 fixed capital £	15	10

Calculated per morgen, the debt is 100 per cent. higher in the latter area. The difference is, however, not as great if calculated per £100 fixed capital. It is clear, however, that if the income is also taken into account, the *Stormberg Area* has a heavier burden of debt. In this area the burden of debt is 31 per cent. of the fixed capital, while the annual gross income is only 10 per cent. of the fixed capital. In the *Drakensberg area*, on the other hand, the burden of dept constitutes 26 per cent., and the income 15 per cent. of the fixed capital investment.

Summary.

The prosperity of the grazing areas is obviously closely bound up with the prices of wool and meat, since these are the two main commodities produced in these areas. In so far as the production side is concerned, the chief problem with which farmers in these areas are faced is the marked difference between the summer and winter carrying capacity and quality of the veld. There are two ways in which the farmer can meet this difficulty. One is to trek to the lower parts, and the other is to make provision for winter feed. The possibilities for both these expedients are, however, limited and vary greatly from farm to farm. It will not be possible to place stock-farming on a sound basis unless a solution is found for this problem of feed scarcity during the winter.

The Storage Disorders in Some Apple Varieties.

[*Continued from page* 780.

Finally, it must be emphasised that these conclusions are based on tests carried out at this Laboratory and *may need modification as more information accumulates*.

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Production of Vegetable Seed.

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THE Union should endeavour to produce its own vegetable seed, since the need for increased food production brought about by war conditions has led to an increased demand for vegetable seeds.

This increased demand and the introduction of shipping restrictions have materially assisted our local vegetable seed industry, which up to the beginning of the war was still much in its infancy. Comparing the development of this industry with that of similar undertakings in other countries, it is clear that our seed industry will have to pass through the same transition stages as the American and Australian seed industries passed through during the last world war, when the seed industry in these countries became established on a sound organised basis. In the same way, public confidence has had to be gained in respect of the high standard of South African produced seed. That this stage has been satisfactorily passed is demonstrated by the fact that Boer pumpkin and Cape Spitzkool seeds are no longer imported, but derived from local sources entirely. Furthermore, there are already areas in this country where one or other type of vegetable is grown exclusively for seed production. The Gamtoos Valley in the Cape Province has, in a period of 10 to 15 years, become an important cauliflower seed producing area. Similarly, pea seed is produced in the Orange River Islands near Kakamas, and onion seed in the Oudtshoorn, Willowmore, Franschhoek and Villiersdorp districts.

Since the seed industry has developed to this stage against foreign competition, it would be a fallacy to look upon it merely as a temporary war measure. On the contrary, no effort should be spared to place the industry on a sound basis now that conditions are favourable for its development.

A survey of the vegetable seed position indicates that there will be a surplus to our requirements of onion and cauliflower seed in the near future. Although it will be possible to export some of this surplus to neighbouring African States and overseas, it would be advisable to study not only our local but also our foreign markets in order that we might cater for their specific requirements and supply them the best seed we can produce. It must be remembered that the best varieties to grow for this purpose are those that have the widest adaptation and give the highest yield of best quality. Further varieties should include good early, mid-season and late varieties to provide the market gardener with a succession of the same vegetable throughout the season. Sufficient sugar and French bean, pumpkin, pea, and eggplant seed is produced. Although runner bean, carrot, beet, parsnip, leek, spinach, cabbage, squash and tomato seed plantings are on the increase, expansion is still possible. Seeds of all root-crops, lettuce and drumhead and round-head cabbages are not yet produced in sufficient quantities.

Everyone realises, of course, that standardised products are attractive and usually command the best prices. To produce a uniform standard type of vegetable, of even grade and of the best quality, the seed should come originally from uniform stock.

Certain standards of quality should be laid down according to which the different types and varieties of vegetables can be selected for seed. The higher the standard set, the better will be the quality

of the resultant product. Nobody wants a woody carrot, a Cape spitzkool with a seed head inside, or a spinach beet with red leaves and thick midrib. Unfortunately many growers who know the good qualities the different vegetables should possess, still do not sufficiently appreciate the necessity for very drastic roguing in the field in order to reach these standards of perfection or maintain them. It is a common sight in many parts of the country, to see a bed or field of carrots left for seed after the earlier, better roots have been marketed. It should be evident to the grower that if such a practice is continued, his seed stock must deteriorate.

Root-crops should be lifted for inspection and transplanted for the best results. By reversing the process and marketing the inferior plants and keeping the best for seed, better seed will be produced—and with better seed, better crops.

The fact that most vegetable crops are cross-pollinating and that pollen may be carried over some distance, or that the pollen of an inferior plant may pollinate a desirable plant yielding inferior offspring, complicates matters still further. Unless in the easily cross-pollinated vegetables like cabbages, carrots, beet and spinach, the inferior plants are removed as soon as they can be detected, roguing later will be ineffective. Varieties of the same kind of vegetable should be planted at least a mile apart to prevent cross-pollination. Lands and surrounding fields should also be kept clean of all weeds, especially those that may cross with the cultivated crops. Good examples are wild carrots found along irrigation canals crossing with carrots, wild mustard and cabbage, wild melon and cultivated melon.

Proper control of pests and diseases, and selection for disease resistance, cannot be too strongly emphasised.

Very few growers realise that with leaf crops, such as lettuce and Cape Spitzkool, and root crops, such as carrots and onions, it is a most undesirable feature from a culinary point of view, when these crops produce seed heads before they are properly mature and fit to eat. This bad tendency, referred to as bolting, can in many cases easily be overcome by removing all early-flowering plants from the field as they appear and before the main crop comes into flower. Seed-growers who may require advice on specific questions in connection with seed production or who find it difficult to contact interested seed merchants, are advised to communicate with the Chief, Division of Horticulture, Department of Agriculture and Forestry, Pretoria, who will render every possible assistance. Arrangements have also been made for officers to advise interested growers and to inspect crops in the field for the benefit of both the seed grower and the seed merchant. It is hoped that in this way a mutual understanding between the seed grower and the seed merchant will result and so pave the way for a more effective seed-certification scheme when the industry warrants it and the facilities for such a scheme become available.

It must be understood that current seed prices are by no means a criterion on which to base future market values. It will, therefore, be desirable for growers to study the local requirements of the different vegetable seeds and popular varieties.

Crops and Markets

A Statistical and Economic Review of South African Agriculture

by

The Division of Economics and Markets

Vol. 21 DECEMBER 1942 No. 244

CONTENTS

* Price Review for October, 1942.

SLAUGHTER STOCK OFFERINGS of cattle were moderate and contained reasonable percentage of primes. Prices gradually showed a firmer tendency which can be attributed mainly to the sharp demand as a result of a shortage of mutton. Ordinary primes on the Johannesburg market, viz., rose from 65s. 4d. per 100 lb. estimated dressed weight *on the hoof* in September, to 71s. 3d. in October, good mediums from 60s. 3d. to 65s. 6d. and compounds from 49s. 2d. to 51s. 2d. Supplies of sheep and lambs, especially on the Johannesburg and Durban markets, were on the whole inadequate and prices on these two markets again rose; while on the Cape Town market prices remained more or less unchanged on a high level. Prime merinos on the Johannesburg market averaged 12·4d per lb. estimated dressed weight on the hoof for October, and prime cross breds 11·4d., while on the Cape Town market prime merinos were 10·7d. per lb. and prime cross-breds 10·3d. per lb.

Porkers were generally scarce and prices rose, e.g., prime porkers on the Johannesburg market from 6·8d. per lb. liveweight in September to 7·7d. in October. Prices of baconers remained unchanged in comparison with the previous month.

Feeding Stuffs.—Feed supplies of all kinds were relatively scarce, although lucerne hay was reasonably plentiful. Prices, however, remained high, for instance, Cape and Transvaal lucerne on the Johannesburg market were respectively 6s. 3d. and 6s. 7s. per 100 lb. for October.

Potatoes.—Supplies were small and inadequate at the beginning of the month. Later on more locally produced fresh potatoes reached the markets. Although the quality in general was poor, it enjoyed an exceptional demand and prices advanced. On the Johannesburg market, Transvaal No. 1 rose from 15s. 1d. per bag in September to 21s. 3d. in October, and N.M. Grade 1 Nos. 2 and 3 from 23s. 5d. and 23s. 9d. to 24s. 6d. and 24s. 4d. respectively. On the

*All prices mentioned in this article are average prices.

Cape Town market Cape No. 1 rose from 20s. to 21s. 10s., and on the Durban market, Natal No. 1 rose from 20s. 5d. to 24s. 11d.

Onions.—Transvaal onions were predominant on most markets. On the Johannesburg market prices declined, viz., for Transvaal onions from 21s. 2d. per bag in September to 17s. 10d. in October. On the other markets prices remained firm.

Vegetables.—Cabbages and carrots were relatively plentiful while green peas, green beans, marrows and squashes gradually increased. The first consignments green mealies also arrived during the month. Prices in general were maintained on a high level.

Tomatoes.—All markets were reasonably well supplied, especially with Transvaal tomatoes. Towards the end of the month, however, supplies began to diminish and prices gradually advanced.

Fruit.—The first consignments apricots and early peaches started to arrive and excellent prices were realised. Oranges, consisting mainly of Valencias, were well supplied, although less than the previous month. Prices hereof again rose, e.g., on the Johannesburg market from 2s. 3d. to 2s. 7d. per pocket in October. On the Cape Town market from 2s. 2d. to 3s. 1d., and on the Durban market from 2s. 6d. to 2s. 11d. As regards tropical fruit, paw-paws and pineapples were exceptionally well supplied. Other kinds were relatively scarce and dear.

Eggs.—Supplies were reasonably plentiful while the demand remained good. Prices showed a tendency to rise. New-laid on the Johannesburg market were 1s. 4d. per dozen, and on the Durban market 1s. 5d. per dozen.

Index of Prices of Field Crops and Animal Products.

This index, as shown elsewhere, advanced from 145 in September to 147 in October. The group "hay" is the only group showing a decrease for the month, viz., from 182 to 156. Other field crops rose from 191 to 227 in October, especially on account of a rise in the prices of potatoes and onions. Slaughter stock rose from 176 to 181 and poultry products from 133 to 141.

Indices of Prices Paid for Certain Farming Requisites.

These indices, as shown elsewhere, changed relatively little during the past three months. The index for fuel rose from 146 in July to 152 in October as a result of increases in the prices of petrol, power paraffin and crude oil. The index for building materials advanced from 167 to 170. That of the remaining requisites all changed little or nothing since July.

Prices of Dairy Products.

THE price of butterfat delivered at creameries has been fixed by the Dairy Industry Control Board at 1s. 6d., 1s. 4d., and 1s. 2d. per lb. for 1st, 2nd and 3rd grades respectively, as from the 1st November, 1942. During the previous summer, that is from December 1941, the price of butterfat was correspondingly 1s. 4d., 1s. 2d. and 1s. per lb.

The price of cheese-milk delivered at factories has been fixed by the Board, as from 1st November 1942, at 9d. per gallon or 2s. 1d. per lb. butterfat contained therein. During the previous summer the fixed price was 7½d. per gallon or 1s. 9d. per lb. butterfat contained therein. As a result of severe droughts experienced during the previous summer, a supplementary payment of ½d. per gallon was made by the Board on all cheesemilk delivered to factories during December 1941 and January 1942, while from the first February 1942, the price of cheese-milk was increased to 8½d. per gallon, and that of butterfat to 1s. 5d., 1s. 3d. and 1s. 1d. per lb. for first, second and third grades respectively.

In the case of milk for condensing purposes, the price has been fixed at 10d. per gallon or 2s. 4d. per lb. of butterfat contained therein, as from 1st November 1942.

Production.—General good rains caused the production of butter and cheese to be much higher than during the corresponding period of the previous season. For example, the factory production of butter in the Union was approximately 2,288,000 lbs. and 2,291,000 lbs. respectively for August and September of this year, as against 1,897,000 lbs. and 1,640,000 lbs. for August and September of 1941. Factory cheese production in the Union was approximately 1,138,000 lbs. and 1,206,000 lbs. for these two months of this year as against 824,000 lbs. and 799,000 lbs. for August and September, 1941.

Control of Rye, Oats and Barley—1942/43 Season.

THE Food Controller has decided to control the abovementioned crops this season in order to ensure that there should be adequate supplies for human consumption, and that the rest of the grain can be used most effectively for feeding of livestock. Because of the fact that rye and rye products are used in the same manner as wheaten products they will be controlled like wheat and wheaten products. In the case of oats, the primary purpose will be to ensure that adequate supplies are available for the manufacture of oatmeal for human consumption, the rest to be used as stock feed for the production of animal food products. The barley crop will be used in the first place for the manufacture of malt and pearl barley, while the surplus will be utilised for stock-feed.

The Wheat Industry Control Board has been asked to carry out the control measures, and as in the case of wheat, producers will be prohibited from selling their rye, oats and barley, except to the Board. For this purpose the Board will appoint agents in all the various areas of production.

Rye, oats and barley, will be taken in by the Board at prices fixed by the Minister, in accordance with quality and grade. The

necessary grading regulations in respect of these cereals will be published shortly.

Taking into account the short crops of these cereals, the Minister has determined the following prices to the producer for the various grades.

Rye.—1st Grade, 23s. 6d. per bag; 2nd grade 23s. 0d. per bag; 3rd grade, 21s. 6d. per bag.

Oats, class A (milling oats).—1st grade, 16s. 0d. per bag; 2nd grade, 15s. 6d. per bag.

Class B (Feed Oats).—1st grade, 15s. 6d. per bag; 2nd grade, 15s. 0d. per bag; 3rd grade, 14s. 0d. per bag.

Barley, Class A (Six-Row Malting).—1st grade, 18s. 6d. per bag; 2nd grade 17s. 0d. per bag; 3rd grade, 16s. 0d. per bag.

Class B (Two-Row Malting).—1st grade, 17s. 6d. per bag; 2nd grade, 16s. 0d. per bag; 3rd grade, 15s. 6d. per bag.

Class C (Feed Barley).—1st grade, 15s. 6d. per bag. 2nd grade, 15s. 0d. per bag; 3rd grade, 14s. 0d. per bag.

Class D (Hulless Barley).—1st grade, 22s. 6d. per bag (200 lb.); 2nd grade, 21s. 6d. per bag (200 lb.); 3rd grade, 20s. 0d. per bag (200 lb.).

Full particulars are embodied in the Government Gazette of the 6th November 1942.

Wheat Prices for the Crop Year 1942/43.

IN order that wheat producers may be compensated for the higher costs of production, and also to encourage the production of wheat as much as possible, the Government has decided that the prices which producers are to receive for the coming crop will be much higher than those of the previous season.

For the 1942-43 season the price of wheat has been fixed at 9s. per bag above the pre-war level. If this had to be borne by the consumer, it would mean an increase of 1d. in the price of 2 lb. loaf of bread. The Government and the Wheat Control Board will, however, subsidise approximately half of this increase as against the pre-war level, while the price of a 2 lb. standard loaf of bread will then only be increased by ½d. up to 6½d i.e. from 1st November 1942. The prices of flour and bran will also be increased from that date. Full particulars in connection with these new fixed prices are given in the Government Gazette of 30th October 1942.

According to this agreement the following prices will be paid to producers during the coming season for wheat in bags:—

Grade.	Class A.	Class B.	Class D.
	s. d.	s. d.	s. d.
1	25 8	25 2	22 2
2	25 2	24 8	21 8
3	24 0	23 6	20 6
4	—	21 3	18 3
5	—	18 7	17 1
6	—	16 4	14 10

These prices are f.o.r. producers' stations and subject to an agent's commission of 9d. per bag in each case, but in addition to these prices, producers will receive the following amounts per bag:—

Grade.	Class A.	Class B.	Class D.
	s. d.	s. d.	s. d.
1..............................	4 10	4 10	4 10
2..............................	4 8	4 8	4 8
3..............................	4 4	4 4	4 4
4..............................	—	3 9	3 9
5..............................	—	3 0	3 0
6..............................	—	2 5	2 5
Under grade wheat............	—	2 5	2 5

A producer will therefore receive 30s. 6d., 30s., and 27s. per bag respectively for Classes A, B and D, Grade 1, as against 26s. 9d., 26s. 3d., and 23s. 3d., for the corresponding classes the previous season (less 9d., agent's commission in each case).

Index of Prices Paid for Farming Requisites.

Year and Month.	Implements. (a)	Fertilizers. (b)	Fuel. (c)	Bags. (d)	Feeding Stuffs. (e)	Fencing Material (f)	Dipping and Spraying Material. (g)	Building Material. (h)
Base—								
1936–38...	100	100	100	100	100	100	100	100
1939......	105	106	98	146	90	114	100	103
1940......	120	139	117	171	95	176	112	124
1941......	124	170	124	175	109	208	115	144
1941—								
January...	124	166	121	152	99	192	113	128
April......	125	166	125	174	109	198	114	136
July.......	125	173	125	182	114	210	117	151
October...	122	173	125	192	114	231	117	162
1942—								
January...	121	146	125	188	115	229	117	164
April......	122	146	134	194	127	228	117	165
July.......	124	146	146	220	147	231	118	167
Oct (j)....	124	146	152	221	146	230	118	170

The following is the composition of the above groups. (The items are weighted according to their respective importance):—

(a) Ploughs, planters, seed drills, harrows, cultivators, ridgers, mowers, binders-hay rakes, silage cutters, hammer mills, separators, windmills, shares, land, sides, mouldboards, knife, pitman, guard.

(b) Superphosphate, ammonoium sulphate, potash, muriate, bonemeal.

(c) Petrol, power paraffin, crude oil, grease, lubricating oil.

(d) Woolpacks, grain bags, sail twine, binder twine.

(e) Mealies, bran, oats, lucerne, groundnut-oil cake, bonemeal, salt.

(f) Fencing wire, standards, baling wire.

(g) Bordeau mixture, lime sulphur, arsenate of lead, cyanogas, Cooper's sheep dip, Little's dip, Tixol cattle dip.

(h) Corrugated iron, deals, cement, lime, flooring boards.

(j) Preliminary.

Index of Prices of Field Crops and Animal Products.

(Basic period 1936-37 to 1938-39 = 100.)

SEASON (1st July to 30th June).	Summer Cereals, (a)	Winter Cereals. (b)	Hay. (c)	Other Field Crops. (d)	Pastoral Products. (e)	Dairy Products. (f)	Slaughter Stock. (g)	Poultry and Poultry Products. (h)	Combined Index
WEIGHTS.	19	13	2	3	34	6	17	6	100
1936-37	118	86	94	93	122	86	89	98	106
1937-38	89	106	112	118	98	112	105	107	101
1938-39	92	107	96	89	79	102	106	94	93
1939-40	86	106	77	93	116	105	106	89	104
1940-41	109	113	106	159	103	108	110	112	109
1941-42	121	132	145	205	101	131	134	163	124
1941-									
January	121	115	98	121	100	104	115	96	109
February	122	115	92	115	100	104	112	107	109
March	135	115	87	125	100	104	105	125	112
April	126	116	98	167	101	106	108	151	114
May	112	116	125	160	101	109	108	157	112
June	110	116	126	183	101	111	111	150	113
July	112	118	128	241	100	130	118	145	117
August	111	118	132	216	100	130	119	102	114
September	118	118	154	228	100	130	128	108	118
October	124	119	138	268	100	128	135	115	121
November	124	137	110	250	100	128	140	118	124
December	127	137	135	199	100	122	147	128	125
1942—									
January	131	137	126	180	100	122	144	141	125
February	132	138	125	168	101	130	140	147	125
March	126	140	140	175	101	130	134	168	125
April	126	139	151	170	102	130	129	175	125
May	158	139	188	181	102	154	132	203	136
June	159	139	207	186	101	154	110	218	139
July	159	140	183	184	166	167	154	163	143
August	150	139	181	175	115	167	155	130	140
September	159	139	182	191	115	167	176	133	145
October	159	139	156	227	115	167	181	141	147

(a) Maize and kaffircorn.
(b) Wheat, oats and rye.
(c) Lucerne and teff hay.
(d) Potatoes, sweet potatoes, onions and dried beans.
(e) Wool, mohair, hides and skins.
(f) Butterfat, cheese milk and condensing milk.
(g) Cattle, sheep and pigs.
(h) Fowls, turkeys and eggs.

Average Prices of Oranges and Pawpaws on Municipal Markets.

SEASON (1st April to 31st March).	ORANGES (Pocket).							PAWPAWS (Standard box).	
	Johannesburg.			Cape Town.		Durban.		Johannesburg.	
	N.M. Navels.	Other. Navels.	Other. Valencias.	Navels.	Valencias.	Navels.	Valencias.	N.M.	Other.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
1938-39	1 10	1 6	1 5	2 0	2 1	—	—	2 0	1 7
1940-41	1 9	1 7	1 6	1 11	1 10	2 4	2 1	2 2	1 9
1941-42	1 9	1 8	2 6	1 10	2 5	1 11	2 1	2 1	1 10
1941-42	1 9	1 8	2 6	1 10	2 5	1 11	2 1	2 1	1 10
1941—									
January	—	0 11	1 9	—	1 10	—	2 11	2 6	1 6
February	—	2 2	2 2	—	2 9	—	—	3 7	2 10
March	—	2 3	2 10	3 0	2 9	2 9	—	3 5	2 7
April	1 9	1 8	1 5	2 5	1 11	2 1	—	2 7	2 1
May	1 9	1 5	1 4	1 7	1 0	2 2	—	2 0	1 6
June	1 8	1 6	1 3	1 7	—	1 8	—	1 6	1 4
July	1 8	1 7	1 3	1 8	—	1 11	1 6	1 5	1 2
August	2 2	2 2	1 7	1 11	1 6	1 10	1 8	1 11	1 8
September	2 4	2 1	1 9	2 4	1 8	2 6	1 8	1 9	1 5
October	—	1 10	1 11	3 2	1 9	3 5	1 8	2 3	1 10
November	—	2 9	2 8	3 1	2 7	—	2 5	3 2	2 6
December	—	2 9	3 6	—	3 5	—	2 6	3 9	2 7
1942—									
January	—	2 6	3 8	2 10	4 7	—	3 11	3 3	2 1
February	—	3 11	4 5	4 7	6 10	3 9	5 8	6 4	3 3
March	—	3 7	2 11	6 6	5 10	4 3	5 6	4 1	3 1
April	2 1	2 0	1 10	3 4	5 0	3 4	2 6	4 0	3 1
May	2 4	2 3	2 1	2 3	2 3	2 6	1 2	3 8	3 1
June	2 3	2 3	1 0	2 1	—	2 6	1 11	2 11	2 5
July	2 5	2 5	1 11	2 1	—	2 6	1 0	2 8	2 2
August	2 11	2 8	2 3	3 0	2 4	3 6	2 4	2 2	1 8
September	2 5	3 3	2 3	3 4	2 2	4 0	2 6	2 1	1 6
October	2 9	2 11	2 7	3 1	3 1	3 7	2 11	2 4	1 9

Average Prices of Potatoes and Onions on Municipal Markets.

SEASON (1st July to 30th June).	POTATOES (150 lb.).						ONIONS (120 lb.).		
	Johannesburg.				Cape Town.	Durban.	Johannesburg.	Johannesburg.	Cape Town.
	Transvaal No. 1.	Transvaal No. 2.	N.M. Grade 1. No. 2.	N.M. Grade 1. No. 3.	Cape No. 1.	Natal No. 1.	Transvaal.	Cape.	Cape.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
1938–39	6 9	6 2	8 10	8 1	8 3	8 10	8 3	8 10	7 4
1940–41	14 2	13 4	18 6	18 5	15 7	16 10	12 5	12 3	9 10
1941–42	19 3	18 7	24 9	25 4	20 1	23 3	10 5	13 11	10 4
1941–42	19 3	18 7	24 9	25 4	20 1	23 3	10 5	13 11	10 4
1941—									
January	11 4	10 1	12 4	11 7	10 2	14 4	7 3	7 3	4 7
February	8 9	8 2	12 1	11 9	14 2	11 0	6 9	7 4	4 10
March	10 10	10 7	13 9	13 8	13 0	13 5	8 1	8 10	5 4
April	14 8	14 10	19 9	19 0	19 4	17 11	8 11	9 9	7 8
May	15 3	14 4	21 1	20 11	16 9	17 11	9 9	10 3	7 6
June	17 9	17 10	22 10	22 7	18 2	21 4	10 8	13 2	9 5
July	22 9	23 5	28 0	28 5	26 8	27 6	16 1	16 1	12 11
August	18 10	19 10	26 10	27 2	24 8	24 9	13 0	19 0	15 3
September	19 2	20 1	25 1	24 8	28 0	26 7	17 1	16 9	13 9
October	26 0	24 10	28 8	28 8	33 5	29 8	11 3	17 1	12 11
November	25 0	24 3	34 1	32 11	26 10	29 8	9 1	—	10 1
December	21 5	20 1	22 2	21 11	14 9	24 8	10 3	12 4	[illegible] 1
1942—									
January	18 8	16 4	20 6	18 11	15 3	23 2	9 3	10 2	7 10
February	15 9	13 11	20 11	20 5	16 3	20 3	9 10	9 9	7 0
March	16 6	15 2	21 4	21 7	18 4	21 3	8 9	9 5	6 7
April	14 6	13 4	21 1	21 2	19 9	18 2	11 9	12 10	7 6
May	15 11	16 1	21 7	21 11	20 2	18 7	11 9	12 10	10 10
June	17 10	17 6	22 3	22 10	17 10	20 4	14 0	14 6	11 7
July	17 0	17 1	21 0	22 3	19 6	19 6	13 7	14 10	12 10
August	14 7	14 10	21 4	22 6	18 4	20 8	15 2	15 4	12 11
September	15 1	16 9	23 5	23 9	20 0	20 5	21 2	20 7	18 10
October	21 3	19 0	24 6	24 4	22 10	24 11	17 10	20 0	25 11

Average Prices of Eggs on Municipal Markets and Prices of Hides and Skins.

SEASON, (1st July to 30th June).	EGGS.				HIDES (per lb.).		SKINS.		
	Johannesburg.		Cape Town, per 100.	Durban New Laid, per dozen.	Port Elizabeth.		Port Elizabeth.		
	New Laid, per dozen.	Fresh, per dozen.			1st Grade, Sun-dried.	1st Grade, Dry Salted.	Merino. Medium, per lb.	Merino. Combings, per lb.	Glovers, Sound, per lb.
	s. d.	s. d.	s. d.	s. d.	d.	d.	d.	d.	s. d.
1938–39	1 0	0 9	7 11	1 1	6·0	5·3	4·1	5·7	2 9
1940–41	1 1	0 10	8 3	1 3	5·8	6·0	4·9	7·6	2 10
1941–42	1 6	1 4	10 7	1 9	7·2	7·3	5·1	8·6	4 0
1941—									
January	1 1	0 9	9 3	1 3	5·9	6·3	4·7	7·3	3 1
February	1 4	1 0	9 2	1 7	5·7	5·9	4·4	8·2	3 1
March	1 8	1 3	11 10	1 10	5·4	5·8	5·0	8·9	3 2
April	2 1	1 7	13 8	2 6	6·3	6·9	6·2	9·1	3 5
May	1 11	1 6	15 8	2 7	6·5	6·8	6·3	8·7	4 0
June	1 8	1 5	14 9	2 0	6·5	6·8	6·1	8·6	4 3
July	1 6	1 4	14 0	1 10	6·3	6·8	4·3	7·8	4 2
August	1 0	0 11	8 9	1 1	6·5	6·6	4·4	8·0	4 2
September	1 0	0 11	8 5	1 1	6·5	6·8	4·4	8·1	4 1
October	1 0	0 11	8 10	1 2	6·8	7·0	3·8	7·7	4 0
November	1 1	1 0	9 1	1 4	7·0	7·1	4·3	7·7	4 1
December	1 5	1 2	9 10	1 9	7·3	7·3	4·0	7·8	4 2
1942—									
January	1 7	1 4	12 2	2 0	7·5	7·6	4·3	7·9	4 0
February	1 9	1 6	13 1	2 0	7·7	7·8	5·7	8·5	3 0
March	2 0	1 9	14 5	2 6	7·6	7·6	6·4	9·2	3 11
April	2 3	1 0	17 1	2 10	7·5	7·6	7·0	10·5	3 11
May	2 6	2 2	18 11	2 10	7·5	7·6	6·7	9·9	4 1
June	2 6	2 3	22 7	2 10	7·6	7·7	6·0	9·7	4 2
July	1 8	1 6	15 1	2 0	7·8	7·9	6·1	9·4	4 0
August	1 2	1 1	10 11	1 2	7·5	7·8	5·6	8·0	3 2
September	1 2	1 1	10 4	1 4	7·5	7·8	4·8	7·8	3 2
October	1 4	1 2	11 2	1 5	7·6	7·8	5·2	8·5	3 3

Average Prices of Lucerne and Teff Hay and Certain Meals for Feeding.

Season (1st July–30th June).	Lucerne (100 lb.). Johannesburg (a). Cape	Lucerne (100 lb.). Johannesburg (a). Transvaal	Lucerne (100 lb.). Cape Town, Cape 1st Grade.	Teff Johannesburg. (a) (100 lb.).	Meals for Feeding—F.o.r. Johannesburg. Lucerne. (100 lb.).	Monkey Nut Cake (200 lb.).	Oats, Sussex Ground (150 lb.).	Bone, 24·8% Protein (100 lb.).	Mixed, 26·4% Protein (100 lb.) (b).
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
1938–39	3 11	3 1	4 0	2 7	6 9	15 2	15 4	8 5	8 [illegible]
1940–41	4 2	3 5	4 3	3 3	6 7	15 3	14 8	11 3	8 [illegible]
1941–42	5 7	5 2	5 8	4 7	8 4	—	17 5	10 11	10 10
1941—									
January	3 9	3 2	4 0	3 9	6 6	15 0	14 6	11 0	8 6
February	3 9	2 8	4 1	2 8	6 6	14 6	14 0	11 0	8 6
March	3 6	3 0	4 5	2 7	6 6	14 0	14 0	11 0	8 6
April	4 0	3 11	5 0	2 10	6 6	14 6	14 0	11 0	8 6
May	5 3	3 10	5 0	2 10	6 9	14 6	14 6	11 0	8 6
June	5 3	4 9	5 5	3 1	7 0	15 6	15 0	11 0	9 6
July	5 2	5 2	5 10	3 10	7 6	15 6	16 0	11 0	9 6
August	5 6	6 3	5 11	3 3	8 0	—	17 0	11 0	9 6
September	6 5	6 1	5 7	3 9	8 6	16 0	17 6	11 0	9 6
October	5 8	5 6	5 1	3 10	8 6	—	17 6	11 0	9 6
November	4 5	3 11	4 11	3 6	8 6	—	—	11 0	9 6
December	5 3	4 10	4 9	4 10	7 6	—	17 6	10 6	9 6
1942—									
January	4 10	4 7	5 1	4 11	7 6	—	17 6	10 6	10 3
February	4 11	4 8	5 5	4 4	7 6	—	17 6	10 6	10 3
March	5 4	4 11	5 7	5 6	8 6	—	17 6	11 0	10 3
April	5 8	5 6	5 9	6 4	8 6	—	17 6	11 0	10 3
May	7 5	6 11	6 7	6 6	9 6	—	18 0	11 0	15 9
June	8 1	7 7	7 9	7 4	9 6	—	18 0	11 0	15 9
July	7 3	6 1	7 10	6 1	9 6	—	18 0	—	16 6(c)
August	7 1	6 4	7 10	5 5	9 6	—	18 0	—	16 [illegible]
September	7 5	6 3	7 5	5 3	9 6	—	18 0	—	16 [illegible]
October	6 3	6 7	7 5	5 0	—	—	18 0	—	[illegible]

(a) Municipal Market. (b) Approximately half of the protein is claimed to be animal protein. (c) Per 150 lb.

Average Prices of Cabbages, Cauliflower and Tomatoes on Municipal Markets.

Season (1st July to 30th June).	Cabbages (bag). (a) Johannesburg.	Cabbages (bag). (a) Cape Town.	Cabbages (bag). (a) Durban.	Cauliflower (bag). (a) Johannesburg.	Cauliflower (bag). (a) Cape Town.	Cauliflower (bag). (a) Durban.	Tomatoes (Trays 15 lb.). Johannesburg. N.M. No. 1.	Tomatoes (Trays 15 lb.). Johannesburg. Other.	Tomatoes (Trays 15 lb.). Cape Town.	Tomatoes (Trays 15 lb.). Durban.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
1938–39	3 10	3 0	3 10	3 0	1 8	3 5	2 2	1 3	1 8	0 10
1940–41	5 10	4 8	7 1	3 11	4 3	5 3	2 7	1 6	2 1	1 2
1941–42	8 10	5 5	11 5	5 9	5 7	7 11	3 1	1 9	2 3	1 6
1941—										
January	5 7	1 5	4 11	3 10	1 6	—	3 4	1 7	0 11	1 4
February	7 4	3 5	11 9	5 6	4 2	9 6	2 7	1 4	1 5	1 2
March	7 4	4 11	10 10	4 10	4 1	5 5	3 5	1 8	2 2	1 4
April	6 0	5 3	6 10	3 11	3 5	5 1	2 11	1 6	2 5	1 7
May	5 3	4 10	5 5	4 2	4 8	4 9	2 5	1 5	1 10	1 4
June	6 2	5 5	8 2	5 6	4 3	6 10	2 7	1 8	2 6	0 11
July	10 3	5 11	8 0	6 7	6 0	6 8	2 10	1 7	2 4	1 1
August	8 5	4 7	4 8	4 4	4 11	5 5	3 5	2 4	1 11	0 9
September	10 0	6 6	3 8	5 6	6 9	6 7	2 9	1 9	2 2	0 10
October	10 3	7 11	4 2	8 4	6 2	—	2 0	1 1	1 9	0 6
November	11 3	8 1	4 8	—	6 2	—	3 3	1 11	2 10	1 7
December	10 2	8 6	3 11	—	4 9	—	3 8	1 8	2 7	1 5
1942—										
January	7 7	5 4	9 1	8 1	4 0	—	2 11	1 0	1 6	2 1
February	8 0	6 3	18 3	5 10	—	—	3 6	1 7	1 5	1 5
March	7 3	6 0	22 9	5 6	8 0	—	5 8	2 7	1 3	2 6
April	8 2	4 9	16 3	6 4	5 8	12 6	5 4	2 6	1 8	1 11
May	7 7	3 9	10 0	6 2	5 0	11 5	3 11	2 4	2 10	1 7
June	6 11	3 2	7 10	6 10	5 2	7 11	2 8	1 5	2 5	1 4
July	7 7	4 5	6 11	6 3	5 2	6 2	2 3	1 3	1 11	1 1
August	6 0	4 7	3 11	3 8	5 11	5 1	2 5	1 3	1 7	0 [illegible]
September	5 9	4 11	2 9	3 11	6 4	6 7	2 5	1 3	1 9	0 9
October	4 2	6 10	2 5	—	4 9	5 5	2 6	1 6	2 0	1 4

(a) Weights of bags vary, but on the average are approximately as follows: For cabbages: Johannesburg 105 lb., Cape Town 105 lb., and Durban 90 lb. For cauliflower: Johannesburg 100 lb., Cape Town 65 lb., and Durban 85 lb.

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TO

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*(The asterisk * denotes that the article is illustrated.)*

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